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STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEC 23 2010

November 30, 2010

Ref. No.: 09HD-112
Author: LD-GH

MEMORANDUM

TO: Ms. Katherine Puana Kealoha, Director
Office of Environmental Quality Control

FROM: for Laura H. Thielen, Chairperson
Board of Land and Natural Resources

Paul J. Conry

SUBJECT: Draft Environmental Assessment (EA) for the Issuance of Direct Lease to Mauna Kea Moo, LLC for Dairy Purposes, Niupea-Kaala, Hamakua, Hawaii, Tax Map Key: 3rd/ 4-1-04:33 and Manowaikohau-Kekualele, Hamakua, Hawaii Tax Map Key: 3rd/4-2-07:02.

The Department of Land and Natural Resources, Land Division, has reviewed the enclosed draft environmental assessment for the above referenced project and anticipates a negative declaration determination.

Please publish the notice of availability for this project on the next publication date of the Environmental Notice.

We have enclosed a completed OEQC Bulletin Publication Form and one copy of the draft environmental assessment along with an e-copy of the publication form and draft EA on a compact disc.

If you have any questions, please feel free to contact Gordon Heit at (808) 974-6203. Thank you.

Enclosures

cc: Land Board Member
Central Files
District Files

ENVIRONMENTAL ASSESSMENT

TMK 3rd/4-1-04:33 and TMK 3rd/4-2-07:02

PREPARED FOR:

MAUNA KEA MOO, LLC

OOKALA, HAWAII

November 2010

Table of Contents

SUMMARY

Applicant: Mauna Kea Moo, LLC
P.O. Box 461
Papaikou, HI 96781

Project Location: Hamakua, Hawaii (Figure 1)

(Figure1)

Parcel Identification: Niupea-Kaala, Hamakua, HI Tax Map Keys: 3rd/4-1-04:33 and Manowaikohau-Kekualele, Hamakua HI Tax Map Keys: 3rd/4-2-07:02

Area: Approximately 1,395 Acres

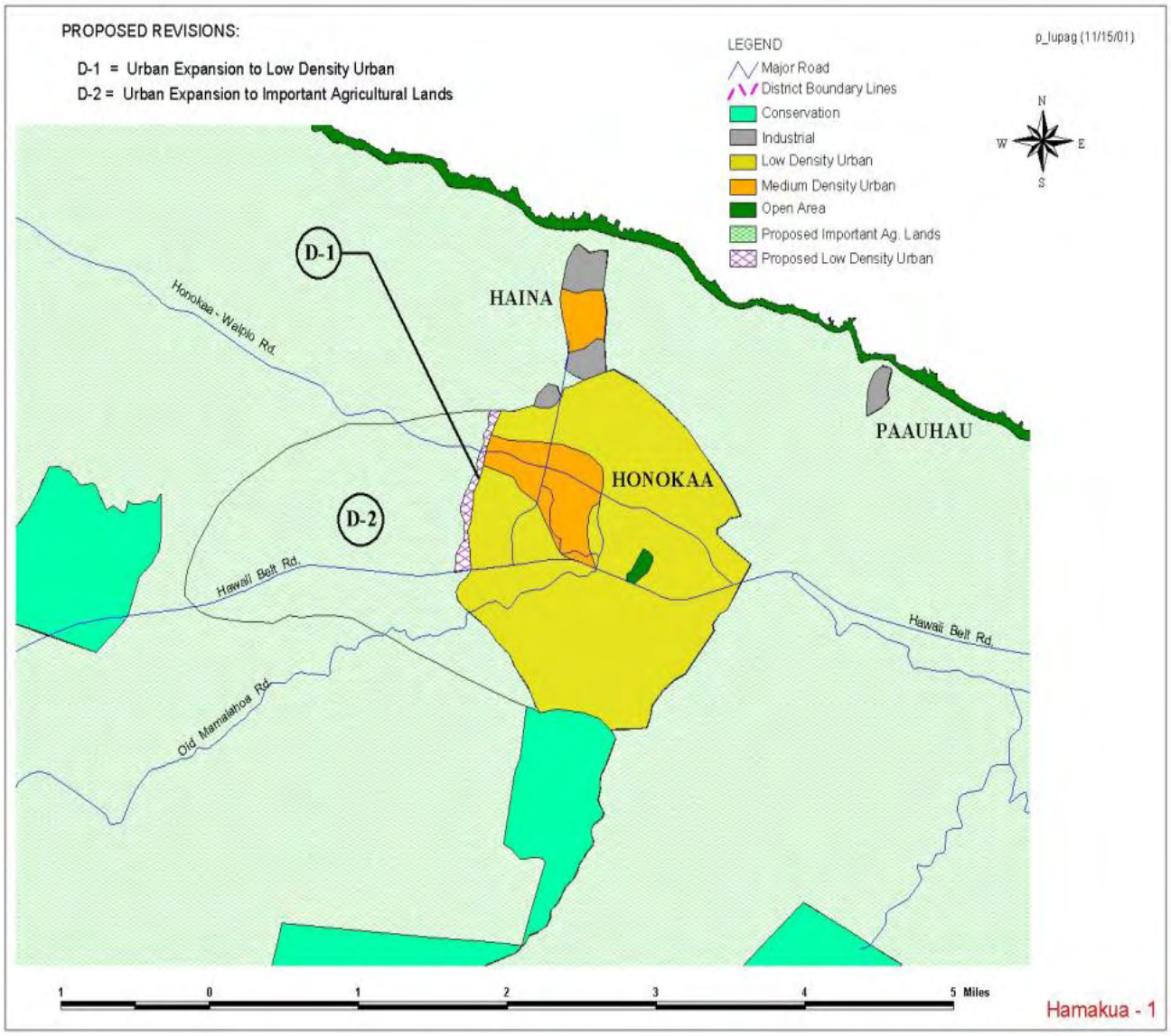
Ownership: State of Hawaii

Existing Use: Abandoned Sugar Cane Land open, vacant land

Proposed Use: 40 year lease for Dairy Farm and Pasturage and Processing Plant for milk. Planting of native fruit and vegetables as well as native trees.

State Land Use District: Agriculture (Figure 2)

(Figure 2)



County Zoning: 40-acre agriculture

Trust Land Status: Section 5(b) lands of the Hawaii Admissions Act
DHHL 30% entitlement lands pursuant to the Hawaii State Constitution: YES

1.0 Identification of Applicant and Approving Agency

1.1 Identification of Applicant

Mauna Kea Moo, LLC
P.O. Box 461
Papaikou, HI 96781

1.2 Identification of Approving Agency

Department of Land and Natural Resources (DNLR)
Division of Land Management
75 Aupuni Street, Room 204
Hilo, Hawaii 96720

2.0 List of Agencies, Organizations and Individuals Consulted

Federal: Natural Resource Conservation Service (NRCS)

US Fish and Wildlife Service

US Army Corp of Engineers

US Federal Highway Administration

US EPA -Pacific Islands Office

State: Department of Agriculture

Department of Bus, Econ. Dev. and Tourism

Department of Labor and Industrial Relations

UH Environmental Center

Department of Health- Environmental Health Administration

Department of Land and Natural Resources

Department of Land and Natural Resources, Historical Preservation

Department of Hawaiian Home Lands

Office of Hawaiian Affairs

Hawaii Department of Transportation

County: Planning Department

Department of Environmental Management

Department of Parks and Recreation

Department of Public Works

Department of Water Supply

Office of Housing and Community Development

Police Department

Fire Department

Libraries: Honokaa Public Library

Hilo Public Library

UH Hilo Library

Elected Officials: Dwight Takamine (Senate District 1)

Mark Nakashima (House District 1)

Dominic Yagong (Council Member)

Billy Kenoi (Mayor)

Neil Abercrombie(Governor Elect)

Individuals: Tom Young, (Hamakua SWCD)

Noel Ide (Hamakua SWCD)

Mike DuPonte, (University of Hawaii, County Extension Agent, Hilo Livestock Programs)

Patrick Niemeyer(NRCS Soil Scientist)

Steve Dias Sr. (Irrigation System Supervisor/worked at this site during sugarcane time for Hamakua Sugar Company from 1967-1994 knows TMKs from top to bottom

Theresa Donham (State Historic Preservation)

Nancy McMahon (State Historic Preservation Division archaeology and historic preservation)

Mike Krochina (Krochina Engineering, Inc.)

3.0 Description of Proposed Action

3.1 Background

Kees was born and raised in Ouderkerk a.d. Amstel in The Netherlands(Holland), where he was raised on the Family dairy. After school and during breaks, he helped his father on the dairy, learning from the start the hard work that goes into the dairy life! When it came time to further his education, Kees chose the field of construction. He attended trade school in the Netherlands and went on to perfect his talents. Although he enjoyed the construction field, he always missed the dairy. Unfortunately his father had passed away so returning to the family business was no longer an option. Kees continued construction work and started his own construction company in the Netherlands.

Meanwhile, back in the USA, California to be exact, Malena was born to a Dutch Father and American Mother. Malena's father owned a dairy in Corona, California. During her childhood Malena spent summers and holidays helping on the dairy wherever necessary. After high school, she attended Riverside City College and California State Fullerton University leaning towards a degree in education. Getting sidetracked along the way, Malena attended and completed Skadron Business College courses just a little slow in her typing and shorthand speeds. During her Skadron days is when Kees entered her life.

Kees and Malena were married in Lake Elsinore, California in May of 1980 and lived in the Netherlands for several years. Kees continued his carpentry business and Malena started working for Bart van Wees on Bovenkerkerweg in Amstelveen, helping to feed animals, clean the barns and make Gouda Cheese! Malena had a lot of fun learning the how to make cheese and visiting with all the tourists that would come and watch the cheese making process. It was fascinating learning the entire process; from feeding the cows, milking them, cleaning the machines and barn, making the cheese, cleaning the cheese area, feeding the whey back to the animals, caring for the cheese that was aging, talking to the tourists and explaining the process to them. Every aspect was enjoyable!

After a few years of life in the Netherlands, Kees and Malena received a call from Malena's father. He wanted to know if they would like to come back to run the family dairy which was now located in Tillamook, Oregon. So Kees and Malena packed up their belongings and moved back to the USA and began working on

the dairy. After some time Malena's father was ready to retire and so the Keas purchase the dairy from him.

Kees and Malena spent 13 plus years dairying in Oregon, producing milk for Tillamook County Creamery Association. All the while, they wished that they could make their own cheese thus improving their cash flow. The only problem was that there were too many cheese companies, the granddaddy of them all being Tillamook County Creamery Association (TCCA). Since they had a contract with TCCA giving them all the milk that the Dairy could produce, it would be too difficult (and costly) to make the transition to making their own cheese.

Finally the opportunity came! In 2003 Kees and Malena's accountant told them of an owner of a dairy on the Island of Hawaii that was looking for someone to help run the dairy there. After much discussion(the rain is much warmer in Hawaii than in Tillamook)Kees and Malena decided to make the move, along with their four children, to the Island of Hawaii! There they could make cheese!

After 5 years of managing Island Dairy, it was clear the partnership was not going to work out. Management idea's and philosophies were not the same so the partnership ended. But the idea of leaving Hawaii had not entered the Kea's minds. They had found their home. The youngest Kea wanted to dairy with his father, the Keas still wanted to make cheese, and somehow that was going to happen. The Kea's would take their philosophies and put them to work!

3.2 Plans

"Hawaii's dairy industry dries up"… "Last dairy closing in Oahu; milk a concern"… "A fading industry" …

All recent headlines indicating the down spiral of Hawaii's dairy industry. Our goal is to change this downward spiral to an upswing bringing back the small thriving family farm to Hawaii. Keeping in mind Hawaii's sustainability along the way.

Kees will use his experience in dairying to design a simple eco friendly layout of a small dairy that will be a model of success in many areas, encouraging other small dairies to start up on the Big Island. The design will encompass optimum animal comfort and health as well as being as sustainable as possible. It will be a dairy their son, who also desires to dairy, will be proud to take over.

In the beginning the milk produced at Mauna Kea Moo will be shipped to Meadow Gold in Hilo, and later will also be used to make local cheese and other dairy products through The Dutch Hawaiian Cheesery (*The Cheesery*).

The long term goal is to have several *small* dairies start up on the Island, all shipping milk to Meadow Gold or *The Cheesery* and receiving a decent payout for all their hard work so they can not only survive but enjoy life as well. A large dairy is very expensive to run, but a small dairy can be run by a family. If several small dairies start up, if something happens to someone, one of the other dairies can pick up the slack until things are back to normal, dairyman helping dairyman.

Keeping in mind that simplicity is best and utilizing Hawaii's natural resources is a must, feed for the cows should be grown on the Island. The pastures need to be kept up and worked to maximize yield. Island farmers may try their hand at raising feed for the dairies giving them another crop for income. This could start up another cooperative of sorts. One that purchases the big equipment and either "rents it out" to the dairyman or has employees that run it (thus ensuring it is used properly) for a fair rate so that the dairy doesn't have big payout for the equipment they will only use once in awhile.

3.3 Building and Leasehold Improvements

The dairy facility that Mauna Kea Moo is proposing may be located on either of the two TMK's. (see location map in Appendix) and will be confined to approximately 10 acres. (approx 1400 elevation) It will consist of :

- Milking barn, Holding pen and Loading bay
- Feed and equipment storage building
- Calf housing
- Waste management system (NRCS approved)
- Lined lagoons for anaerobic digestion
- Shades and feed alley
- The infrastructures
- House

Milking barn, holding pen and loading bay : This structure will be a New Zealand style swing milk parlor with holding pen. In this area the cows will be washed and milked. All milking and barn feeding equipment and systems will be housed in this building and the loading bay will be under the same roof. Wash water will be recycled and reused for flushing of alley ways. The barn will have a tank room for storage of milk. The barn building will also have storage area, a medicine room, office, employee break room and bathroom.

Milk processing building: The milk processing building will be the relocated glass building previously located at the Tex Drive In area in Honoka'a. The size of the building is 3500 sq feet and will be located on approximately 4 acres on TMK 3rd/4-1-04:33 at approximately 920' elevation. The processing area will be

built according to state and federal guidelines and rules. A house will also be built on this parcel.

Feed and equipment storage building: This structure will be 100' x 40' and consist of 8 bays for storage of feed and farm equipment while not in use.

Calf housing: This is a 60' x 30' structure for housing calves in individual stalls.

Waste management system: This will be a system, approved by the NRCS, for collecting all manure and waste at the barn, holding pen, and concrete surfaces into a collecting pit. This will be agitated and pumped over a manure separator located above the pit. The solids which will be separated will be conveyed to a curing area for production of compost. The effluent is used for flushing lanes (recycled) and as a nutrient for the pastures. (See Appendix for flow chart and pictures.)

Shades and feed alley: Shades will be approx 200' x 18' and will cover concrete feed area to keep cows cool and comfortable while eating and feed dry during rain.

The infrastructures: These will include:

1) 3 phase power at the facilities
2) improving and paving some of the existing roads.
3) extensive cross fencing of pastures
4) water system

House: For owner or manager

In the future if there is a need for milk another small dairy could be built on the other parcel.

3.4 Use

The use of this property will be for grazing of lactating and non lactating dairy cattle and the facility to milk and conduct activities of a dairy farm. The total number of cattle will be approximately 600 head from birth to mature 1300# animals.(+/- 200 milking +/- 100 dry and 300 heifers and baby calves)

3.5 Financial Projections

The estimated costs of dairy improvements are as follows:

Planning Costs:	$ 40,000.00
Fencing;	$ 75,000.00
Infrastructures:	$140,000.00
Buildings and Structures	$275,000.00
Milking and Support Equipment	$175,000.00
Pasture Improvement	$ 75,000.00
Other Equipment	$120,000.00
Total Estimated Costs:	$900,000.00

3.6 Further Design and Process Details

The design and construction of the waste management system will be carried out with assistance of NRCS and the final approval by the Department of Health, Wastewater Branch. However in principal the flow chart in the appendix will highlight the steps necessary in order to address this topic. The size of the facility will have to meet the waste generated as well as allowance for future expansion and handling requirements. In brief the wastewater and manure will be collected in appropriate size concrete pits. This is agitated and pumped over mechanical separators to separate the solids for compost and the effluent is then either recycled to flush surfaces (to remove manure from concrete surfaces) and or is diverted into holding lagoons which are lined for further anaerobic digestion and eventually used for irrigation. The total acreage under irrigation will be approximately 300 acres on TMK 3rd/ 4-1-04:33 plus extra paddocks as needed on TMK 3rd/ 4-2-07-:02 determined by NRCS and Department of Health.

4.0 Description of Action's Technical, Economical, Social and Environmental Characteristics

4.1 Physical Environment

Pasturage and dairy farming on former sugarcane land would be one of the best uses. Pastures would be one of the least disturbing crop with minimal to no cultivation. The proposed use would have no new impact on the physical environment and will enhance the esthetics of the region.

The ownership of these parcels are with the State of Hawaii, Department of Land and Natural Resources. These are believed to be ceded lands and were formerly in sugar cane cultivation. In the Appendix you will find a custom soil resource report done by the USDA NRCS on August 30,2010. Soil samples were taken from 5 different locations (see location map in Appendix) and Mike Duponte from the University of Hilo processed them. The test results follow the NCRS Soil report in the Appendix.

The annual rain fall is from 90-120 inches depending on the elevation. The elevation of the site is from 900 to 2200 feet above sea level and the proposed location of the dairy will be at approx 1400 feet elevation and the processing plant will be at approx 920 feet elevation.

4.2 Social Characteristics

The life style of North Hilo and Hamakua region is distinctly rural with deep ties to agriculture. The warm friendly atmosphere is an integral part of the community. A small family dairy farm and pastures would be consistent with the rural character of the region. If you read the Final Hamakua Agriculture Plan of May 2006 you can see that Agriculture is a key ingredient to their plan. "By supporting and fostering successful diversified agriculture, we honor and maintain the agricultural based lifestyle that defines our community. We create economic opportunities for our residents and create a local food supply allowing the Hamakua community to become more self sustaining"

4.3 Economical Characteristics

A dairy farm would have a very positive impact on the economy of the region in the improvement and the construction phase as well as the operation phase.

The dairy operation would use family, as well local labor. It would run 365 days a year and need labor on a regular basis. There would also be secondary positive impacts such as delivery of some feed and supplies, repair and maintenance which would also occur at the processing level in the plant and retail levels. Agricultural products from other Island producers will also be used in the products produced at the processing level. It will help to bring the Island a step closer to sustainability.

4.4 Public Facilities

On the site, at any one point in time there would be 8-10 employees including family. There will be a graveled public parking for those wishing to visit the facilities and restrooms for employees as well as visitors. There would be no new impact on public facilities, traffic , flood and drainage associated with the proposed use. (There will be no change to the contours that were put in place by the sugar cane company)

4.5 Relationships to Land Use Plans and Policies

Dairy operations and pasturage are consistent with Hawaii State plan as outlined in Chapter 226-6;

(a) Planning for the State's economy in general shall be directed toward achievement of the following objectives:

> (1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.
>
> (2) A growing and diversified economic base that is not overly dependent on a few industries.

and in chapter 226-7

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:

> (2) Growth and development of diversified agriculture throughout the State.

(b) To achieve the agriculture objectives, it shall be the policy of this State to:

(5)Foster increased public awareness and understanding of the

contributions and benefits of agriculture as a major sector of Hawaii's economy

(13) Promote economically competitive activities that increase Hawaii's agricultural self -sufficiency.

4.6 State Land Use Law

The site is an Agricultural District. The proposed use is permitted within the Agricultural District. A district boundary amendment is not required.

4.7 County Development Plan and Zoning

The current County zoning of the site is agriculture. Under current county zoning, no zone change for the proposed use is required.

4.8 Required Approvals

State of Hawaii: **Department of Health**

All constructions have to comply with Title 11, Hawaii Administrative Rules, Chapter 15, Milk, Chapter 20 Potable Water Systems, Chapter 26 Vector Control and Chapter 62, Wastewater. A wastewater management plan to address the animal waste will need to be submitted to Wastewater Branch to be reviewed and approved.

County of Hawaii **Department of Public Works**

All construction shall conform to all requirements of code and statues of County of Hawaii. Solid waste management plan shall conform to the rules and regulations of the County of Hawaii, solid waste division.

Planning Department

All construction shall conform to all requirements of code and statues of County of Hawaii.

Department of Water Supply

Any water meters provided by the Department must be installed in accordance to the requirements of the department.

5.0 Summary of Major Impacts

5.1 Short Term

Erosion: There will be a slight increase in possibility of erosion during the construction phase, and a minimal amount during fencing. The facility will be nearly centrally located on existing roads to minimize the need to develop additional roads and therefore the possibility of increased erosion. Furthermore as a practical and prudent management practice the construction will be carried out in phases in the driest period during the year. The total area of the construction will be less that 1% of the total acreage.

Soil: There will be no effect on the soil during the construction phase. The site will be such a small fraction of the total acreage that it will have little to no effect on the landscape.

Traffic: There will be a slight increase in the traffic in and out of the property, however as the site is on the main highway its effect is negligible to the community.

5.2 Long Term

Erosion: Pasture usage would be one of the best uses in terms of erosion. The cow traffic at the dairy site will be concrete surfaces and in the future *if the* rainfall becomes too excessive the cows may need to be housed in free stalls to reduce possible erosion during these periods.

Soil: The soil has been tested and the results is included in this EA.

Air: No effect on air quality is foreseen.

Odor: Since the cows are not confined for a significant amount of time (only during milking)there will be no significant odor from the cows. The facility will also be at approximately 1400' elevation and has an existing buffer of trees surrounding the property. Optimum waste management and animal care will be used as well as following guidelines and rules of the NRCS and Health Department.

Water: The water supply will consist of (1)county water which available for limited use on parcel 33 and will be arranged with the Department of Water Supply as the project progresses. (2) Structures will be designed with a catchment system. This will also avoid any run off. (3) Potable Water can be hauled in if necessary with a stainless steel tank. (4) In the future an engineered well may be drilled for potable water use for

the dairy and processing facilities. (5)Catchment ponds will be put in the higher elevations with help and in compliance with the SWCD, NRCS and DLNR.

Flora & Fauna: Little impact on the flora and fauna is foreseen. The site is already primarily sugarcane and grasses, and there will be little alterations. The primary location of any flora & fauna will be in the gulch areas. These areas have little feed value and are a problem from the management stand point. Therefore all of these areas will be fenced off to the cattle. No effect on the wildlife in the area is foreseen.

Noise: The dairy will generate very little increase in noise levels. The location of the facilities on the site will also provide a buffer zone.

Archeological/Historical Site: No site of historical or archeological significance are known to exist on the site. Because the long-term use of the land for agricultural purposes (sugar cane crops)It is unlikely that any significant historic sites would remain on the 1395 acres of the proposed lease. The maps that have been consulted show some burial sites in the area but none are shown on the 2 TMKs in question. Steve Dias , a long time resident very familiar with the TMKs also recollects no burial or archeological sites on the TMKS. The State Historic Preservation Division is also looking into this for the project. Mauna Kea Moo., LLC has signed up with the SWDC and will be working with them to create a Conservation Plan that fits into all that is important to Hawaii. The use of the subject parcels for the dairy and processing operations will have no effect on significant historic sites. In the unlikely event that some evidence of historic use of this land is found, such as artifacts, the State of Hawaii, Department of Land and Naturals Resources State Historic Preservation Division would be notified so that their staff would have the opportunity to investigate the findings. The maps that have been consulted show some burial sites in the area but none are shown on the 2 TMKs in question. The State Historic Preservation Division is also looking into this for the project.

Nancy McMahon was contacted as a cultural assessment provider and has added an archaeological, historical and cultural impact assessment that has been included in the Appendix of this Assessment.

Aesthetic: The dairy and processing facilities will be constructed to enhance the beauty of the land. In developing the facilities Mauna Kea Moo will take advantage of the existing infrastructure such as existing cane roads and natural shade so as not to change its current grandeur.

Economic: The dairy and processing facilities will have a distinct positive economical input on the community. The dairy will provide steady well paid employment. The positive impact will be rippled into supporting

suppliers, service providers, and retail end of the industries. This will also help keep Revenues within the state rather than to mainland producers. There will also be increased tax revenue for the state.

Social: Secure employment in a local agriculture will have a positive social impact. This conforms to the region's history. Supporting community activities and tours for elementary schools will be a regular part of running the dairy and processing facility.

5.3 The Direct, Indirect and Cumulative Impacts of Dairy Waste Management Activities.

A sound waste management plan and facility is a fundamental and integral part of a dairy. Such a plan will both eliminate potential environmental problems as well as increase efficiency of the nutrient replenishment. The Kea's dairy in Tillamook, Oregon worked closely with local and state agencies in preparing a workable Confined Animal waste management plan that worked well with the dairy there and the Kea's and we will do the same here. The dairy on the Hamakua Coast will have to meet the most current standards and requirements in waste management. The overall objective is to minimize waste volume, collect waste, in the process avoid any possibility of leaching and use the effluent for irrigation over sufficient acreage to avoid accumulation of nutrient. This design and adequacy of the facilities will be carried out jointly between The Kea's, the NRCS and the Department of Health. The operation of the system will be monitored by regulatory agencies.

The waste from dairy cattle will be a great asset to the land. A sound management system will enhance the return and supplementation of the nutrients to the land.

Because of the low nutrients found in the soil and grass samples taken (see appendix) The dairy animals will be introduced to the land slowly so that the nutritional value of the pasture can improve. As the pasture improves the AU (animal units) can be increased according to the Land Study Bureau rating system. The local SWCD, NRCS and University of Hawaii County Extension Office will also be consulted to insure proper management.

6.0 Alternatives Considered

A suitable site for a dairy should meet the following criteria;

Size; In order to mange waste properly and provide enough feed for the animal a sizeable parcel of land is necessary. The proximity of the 2 parcels make waste management feasible.

Soil and Climate: A suitable site requires that the right type of soil for productive pastures. The rain fall should also be sufficient throughout the year, however not excessive. The temperature should be cool to avoid heat stress and fly problems.

Infrastructure: Roads, water and power should be in proximity.

Layout: The site must have sufficient buffer zone to avoid negative impacts of agricultural operations such as noise, smell, insect pests or aesthetic impacts.

Availability of Long Term Lease: The substantial investment required will make any lease under 30 years impractical, and 50 years is preferred.

Topography: Low gradient slope are desirable due to reduce erosion and water problems.

The following sites have been considered:

6.1 State Owned Lands

North Hilo, Hawaii, TMK:3rd/3-1-04:01 500 acres by Hakalau

The problem with this site was that it is currently on a month to month lease with someone else who grazes beef animals on it...and the current renter was unwilling to relocate. We could find no more state owned lands suitable.

6.2 Private Lands

(a) The old Island Dairy site in Ahualoa

The problem with this site is that the owners didn't want to lease it out to another dairy.

(b) The old Duarte Dairy site in Paauilo

The problem with this site is also that the owners didn't want to lease it out to another dairy.

7.0 Proposed Mitigation Measures

7.1 Soil Erosion Control Measures

Ground cover and native trees will be retained to avoid run off and soil erosion. The pastures will be laid out to minimize traffic and rotational grazing practices will be adopted to further minimize soil erosion. High traffic area near the barn will be concreted.

In the case of excessive rain fall periods free stalls maybe constructed to further reduce exposure of pastures to cattle in sensitive times. The runoff water on the facility will be captured and utilized to increase efficiency and minimize risks of erosion. Drainage ditches shall be maintained on a regular basis.

7.2 Waste Management

A pasture operation will minimize waste management problems. However an extensive system of collection and use of effluents shall be designed to convert waste into nutrient. This shall be designed to best management practice standards and shall meet the NRCS and Department of Health regulation and standards.

7.3 Natural and Physical Environment

The structures will be located to improve cow traffic and provide a buffer zone to eliminate the possibility of any nuisance noise or smell. It will also be kept clean to avoid smell and fly problems.

The gulches will be fenced off to avoid the cattle entering these areas and possibly destroying any native plants.

The design, construction and use of the facilities shall be conducted with aesthetics in mind. The trees will be preserved and increase whenever possible as they will also provide shade for the cattle. The existing cane roads will be kept in place and improved where needed. The objective of the operation is to blend in the region and community as well as enhance it.

8.0 Determination, Findings and Reasons for Supporting Determination

8.1 Significance Criteria

According to the Department of Health Rules (11-200-12), an applicant or agency must determine whether an action may have a significant impact on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects, and its short and long-term effects. In making the determination, the Rules Establish "Significant Criteria" to be used as a basis for identifying whether significant environmental impact will occur. According to the rules, an action shall be determined to have significant impact on the environment if it meets any one of the following criteria:

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resources:

The proposed use is in conformity to it past and designated use. No significant archaeological or historic sites are known.

(2) Curtails the range of beneficial uses of environment:

This site is designated for agricultural use and most desirable for diversified agriculture.

(3) Conflicts with the State's long term environmental policies or goals and guidelines as expressed in Chapter 344, HRS and any revisions thereof and amendments thereto, court decisions, or executive orders;

The proposed use is consistent with the Environmental policies established in Chapter 344, HRS, and Nation Environmental Policy Act.

(4) Substantially affects the economical or social welfare of the community or state:

The dairy and facilities will have a positive impact on economical and social welfare of the community. The economical benefits will further ripple in the county as well as state as the dairy uses more and more of the Islands products in their processing facility.

(5) Substantially affect Public Health:

The design, construction and use of the facility will be carried out with supervision and approval of the Department of Health. The dairy and cheesery will not be allowed to operate if they are deemed to affect public health adversely.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities.

The proposed use is compatible with the region's history and will not create significant secondary impacts.

(7) Involves a substantial degradation of environmental quality.

Proper design and utilization of dairy and processing facility will not have a substantial impact on the degradation of environmental quality. This dairy and processing facility will be constructed to the best management practices to date and will have a positive impact on the overall environmental quality.

(8) Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions"

An efficient dairy operation has to conform to its environment and any conflicts will translate to operational problems for a dairy. Therefore in order to establish a long term profitable operation all the details must be considered in the design, construction and use of the facility. Therefore there are no significant cumulative impacts are anticipated.

(9) Substantially affects a rare, threatened or endangered species or its habitat:

This site is former sugar cane land and all gulches will be fenced off. There are no known endangered plant or animal species on the cultivated region of the sited.

(10) Detrimentally affects air or water quality or ambient noise levels.

A waste management plan is required and its design and use are to prevent any air (smell) and water quality hazards, The noise level will be negligible from such an operation.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary freshwater, or coastal water:

The site does not fall into the above categories. However soil erosion concerns are an integral part of most farming operations. Pasture is the most suitable use in the regard. The design and the location of the facilities will be to minimize soil erosion.

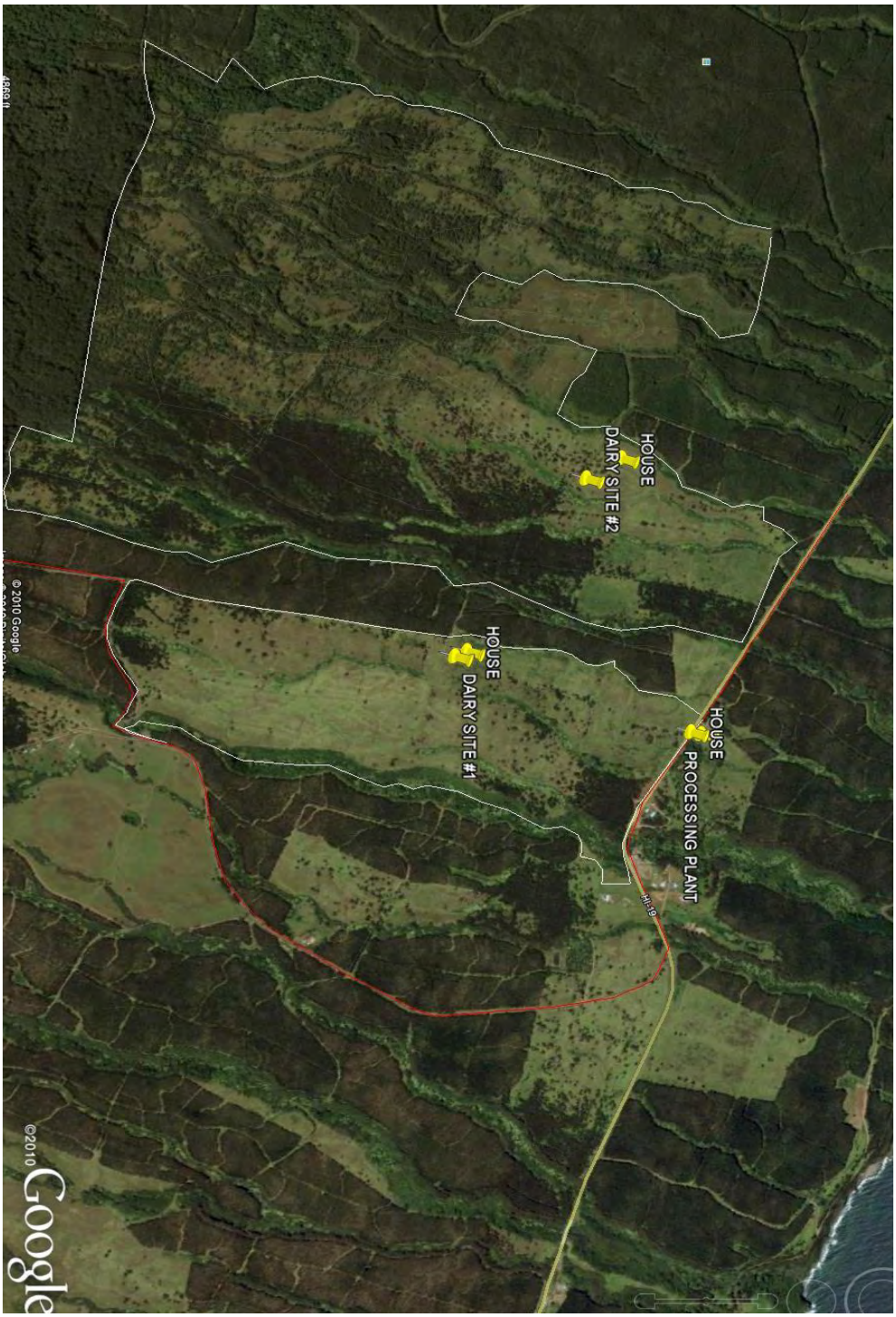
(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies:

Pastures will not significantly affect the scenery. This use will enhance the aesthetics of the region.

(13) require substantial energy consumption:

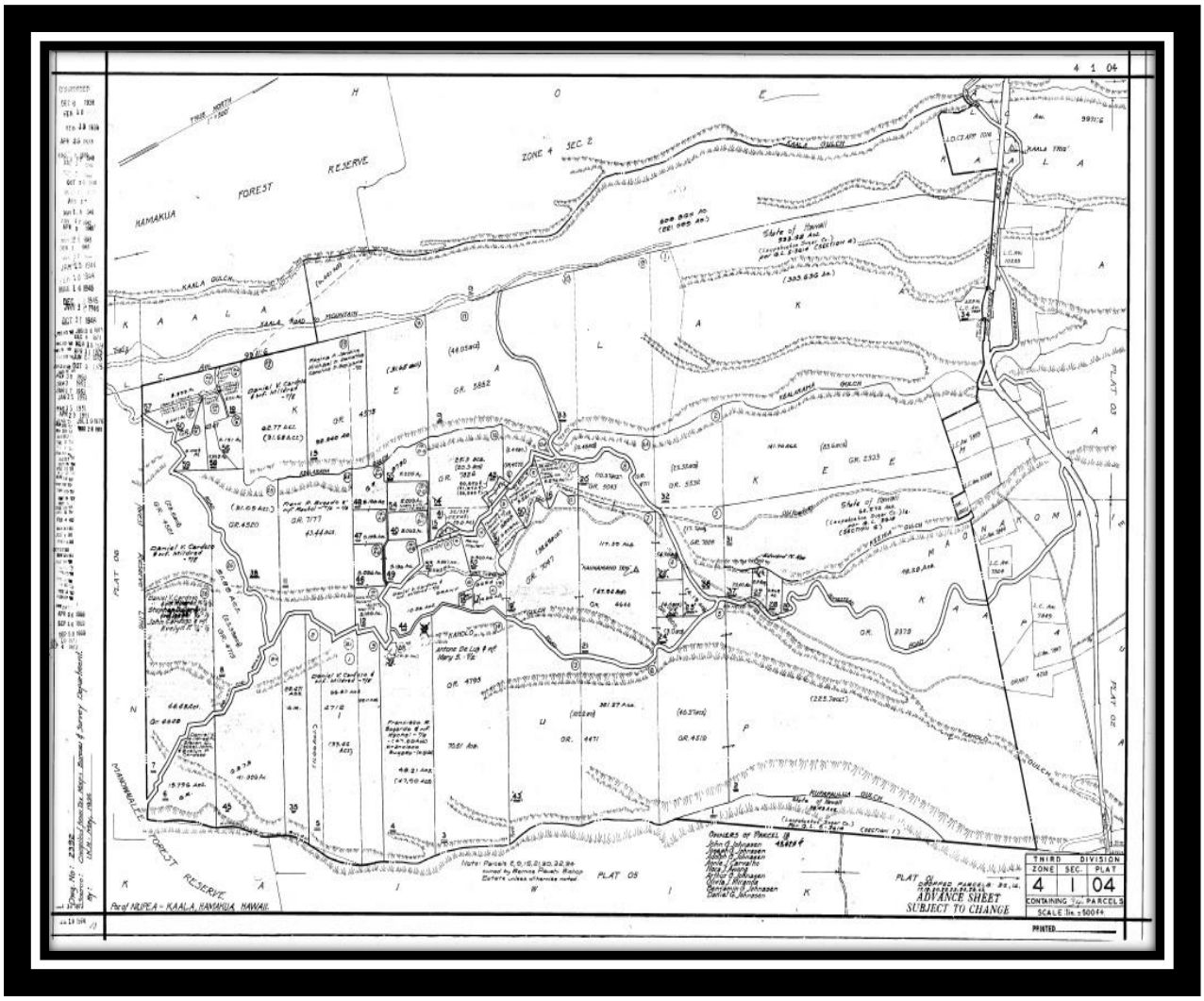
A dairy and processing facility and pasture operation will not require substantial energy. However planning alternative energy is a goal of the operation. This falls into the self sustainability that the operation will work towards.

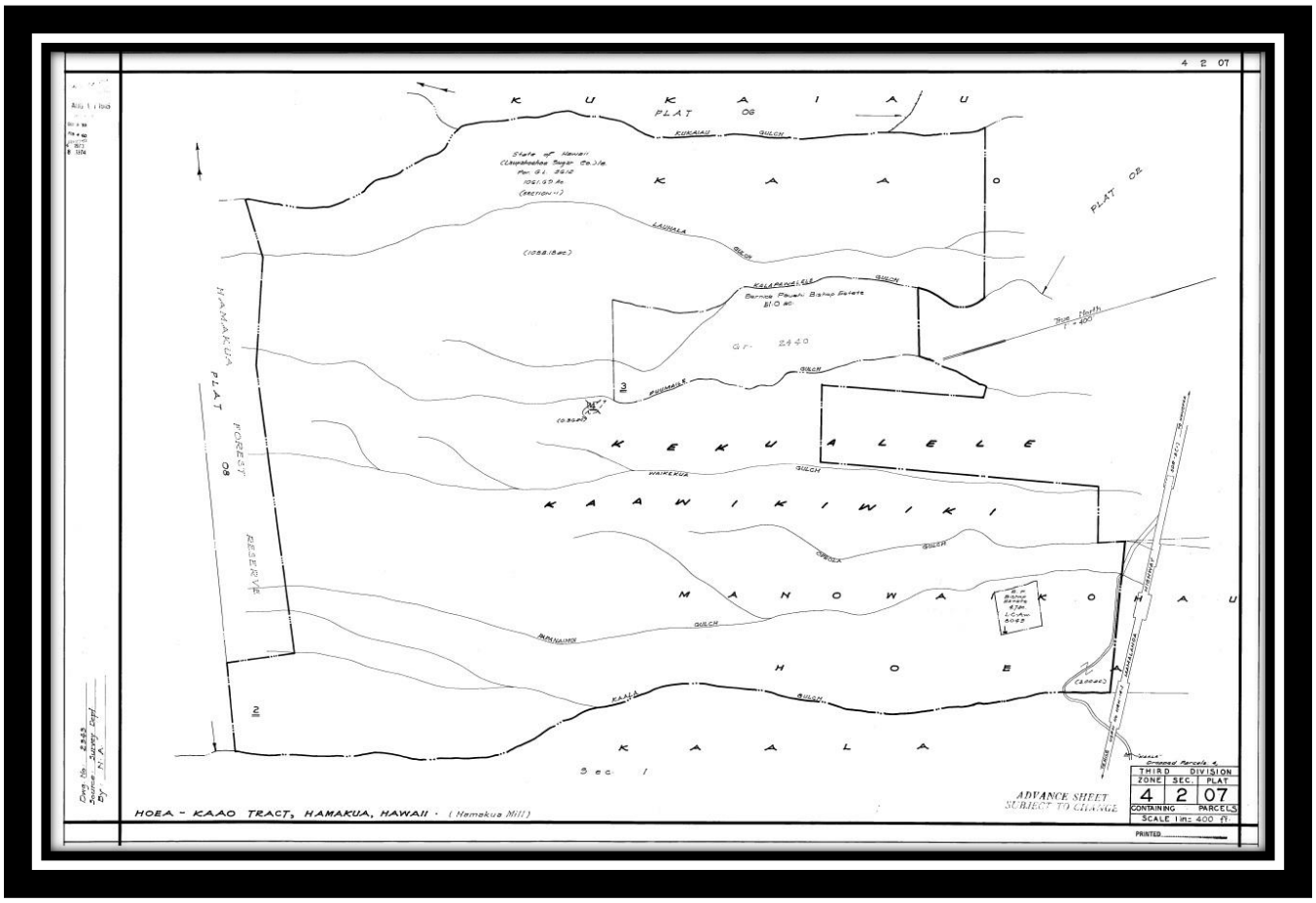
APPENDIX


HOUSE
DAIRY SITE #2
HOUSE
DAIRY SITE #1
HOUSE
PROCESSING PLANT
HI-39
© 2010 Google

Site Map

TMK 3rd/4-1-04:33




4 2 07
K U K A I A U
PLAT 08
KUKAIAU GULCH
State of Hawaii
(Ckokohaohao Sugar Co.) Ltd.
Por. R.L. 3520
106.69 Ac.
(Section 4)
K A A A O
PLAT 08
KAUHALA GULCH
(1058.18 ac.)
KALAPAHOLEE GULCH
Bernice Pauahi Bishop Estate
81.0 ac.
G.P. 2440
PAUMALU GULCH
(0.30 ac.)
HAMAKUA PLAT FOREST 08 RESERVE
K E K U A L E L E
WAIKEKUA GULCH
K A A W I K I W I K I
GULCH
M A N O W A K O H A U
MANNAMOI GULCH
H O E A
KAAA GULCH
K A A A L A
Sec. 1
HOEA - KAAO TRACT, HAMAKUA, HAWAII · (Hamakua Mill)
ADVANCE SHEET
SUBJECT TO CHANGE
THIRD DIVISION
ZONE SEC. PLAT
4 2 07
CONTAINING PARCELS
SCALE 1 in. = 400 ft.
PRINTED

ARCHAEOLOGICAL, HISTORICAL AND CULTURAL IMPACT ASSESSMENT FOR MAUNA KEA MOO LLC

TMK: (3) 4-1-04: 33
4-2-07: 02

NIUPEA-KAALA, MANOWAIKOHAU-KEKUALELE, HAMAKUA, HAWAII

NANCY MCMAHON, M.A., M.ED., RPA
November 2010

INTRODUCTION

Mauna Kea Moo, LLC is seeking a long term lease with the Department of Land and Natural Resources for the use of the above parcels TMK: (3) 4-1-04: 33 and 4-2-07: 02 (1395 acres) for agricultural products including a dairy.

Environmental Setting

The project area is located on the lower northeastern slopes of Mauna Kea and consists of the Hamakua volcanic series (Sterns and MacDonald 1946). The Hamakua volcanic series consist mainly of basaltic lava flows. The soils of the project area are classified as Honokaa, Kukaiau, and Ookala Silty clay loam which is well drained silty clay loams formed in volcanic ash. The soil was previously utilized for sugarcane until 1991 by Hamakua Sugar Company. The former sugarcane fields are predominantly overgrown with guinea grass (Panicum maximum) with a scattering of young Ironwood trees (Cassurina equisetifolia). The project area has a history of continuous disturbance for sugar cultivation since the Ookala Sugar Company (renamed Kaiwiki Sugar Company-1909, merged with Laupahoehoe Sugar Company - 1957 as Hamakua Sugar Company) in 1969.

Archaeology and Historic Sites and Context

Much of the early surviving history of the Hawaiian Islands had its setting on the island of Hawaii. Archaeological evidence indicates that this island was settled by the Polynesians at least as early as 700 - 800 A.D. Tentative evidence also suggest that it is likely to have been settled as early as 300 - 600 A.D. Many of the significant figures of Hawaiian history before the arrival of Captain Cook had their domains on the island of Hawaii; Paao, Liloa, Umi-a-Liloa, Keawe-a-Umi, Lonoikamakahiki, Alapainui. This is also true of many significant figures of the early historical times; Kalaniopuu, Kamehameha, Keoua, Ka'ahumanu, Keeaumoku, Kuakini and Kapiolani. The island was also home of special deities such as Pele and Her relatives, and Poliahu. Today historic sites are found throughout each district of Hawaii. Hamakua is one of the district of Hawaii.

HAMAKUA

Most of the early history of the Hamakua district centers on Waipio Valley. The valley was settled early and was the home of several strong rulers since at least the early 13th century. Among the chiefs of Waipio were Liloa and his son Umi. The traditions regarding Liloa indicates he was the first to rule

over the entire island of Hawaii and that his rule was one of peaceful diplomacy.
In 1790, Kamehameha took control of northern Hamakua and Keoua, chief of Hilo after killing his uncle took control of southern Hamakua. Two battles took place in Hamakua with Kamehameha. Keoua was killed by Keeaumoku in Kohala, which lead to Kamehameha's control of the island of Hawaii.
In 1823 the Rev. Ellis counted 265 houses in the valley and estimated the population to be 1,325. The number of residents has declined steadily since Ellis' estimate. The same is true of the once populated Waimanu Valley. Hawaiians also lived in the smaller valleys and gulches along the Hamakua coast and were known to cultivate taro.
In relatively recent historical times there have been Asian and European influences in Hamakua, due primarily to the sugar industry. These influences have erased much of the physical evidence of the earlier culture, but have also introduced a different perspective on historic sites.

The Hamakaua Coast was the site of rich agriculture and significant population before Hawaii had contact with the West in the 18th century. In the words of Ross Cordy, Ph.D. who undertook a regional archaeological synthesis of the Hamakua District.

> "It was here that the complex political system arose which successfully dominated Hawaii Island and eventually the entire archipelago" (1994:6).

Agriculture consisted of dry land farming or taro, sweet potatoes, bananas and other crops. Houses were concentrated on the lower elevations of the uplands; major trails also crossed this region. Many historical and legendary events occurred along the Hamakua Coast both in Waipio Valley and outside, in the smaller stream valleys and uplands that make up most the district.

The physical evidence of this heritage has largely been obscured and even erased by the subsequent plantation agriculture. Sugar plantation operated from the mid-1800s until 1991 (when the land was left fallow by Hamakua Sugar Company which closed in 1994), using most of the available land in Hamakua below 2000 feet in elevation. Only the gulches escaped use, but here over a century of overgrowth, stream floods and landslides haven their toll on the prehistoric landscape.

Over a century of plantation life has itself left a rich landscape expressed best in the many plantation towns scattered along the coast, camp houses, stores, common buildings and streetscapes are charming and replete with cultural and historical information.

Inventory studies undertaken in the 1970s as part of the State's Historic Preservation activities noted the historic resources of the Hamakua. Files at

the State Historic Preservation Division (SHPD) contain information collected during the 1960s on Paauhua, Haina, Paauilo, Ookala and Papaaloa Camps. There are no historic properties for the project area that are listed on the State or National Register of Historic Places. The files at SHPD indicate that no known historic sites located in the project area. A letter from Don Hibbard dated October 22, 1998 (Log No. 22416/Doc No. 9810MS03) for a TMK: (3) 4-1-4: 33 that use of the area for pasture would have "no effect" since that land had been previously cultivated for sugarcane. Based on a review of the literature, aerial photographs, interviews with residence and others knowledgeable about the area there would be no historic properties affected by the continual use of the land for agricultural purposes. Mauna Kea Moo LLC plans to place perimeter fencing for their cattle and fence off all gulleys, gulches and valleys.

Cultural Impact

Interviews were conducted with long time residents of the area who are familiar with Native Hawaiian and other cultural practices. Theses discussions indicated that there are no Native Hawaiian and other cultural practices dependent on the project area either as a resource or for access purposes. Area residents utilize the higher elevations in the region for pig hunting and the coastal areas for fishing. These activities will not be affected in any way by the proposed dairy.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

There are no known historic properties in the project area and there are no cultural impacts.

The heritage of a community is documented by history, a series of past events. The physical evidence of such documentation is often contained in archaeological and historic sites which support the written or traditional legacy.

The identity of a community evolves from the past. One way of understanding the present is through historic perspective, as our cultural values are basically derived from past generations. A three-dimensional record of the past puts us in a better position to judge and understand our contemporary values, progress, and lifestyles, as well as to illustrate our history.

The State's Historic Preservation Division indicates that over 10,000 have been identified and that there may be a total of 100,000 - 300,000 sites on the island of Hawaii. These sites often provide information of Hawaiian

history and culture prior to the arrival of Captain Cook and for which there often are no written sources. Other sites include those which have been significant in historical times. The historical process encompasses the development and evolution of Hawaii from the earliest settlement to the arrival of the various ethnic groups whose cultural lifestyles have blended to form what is now Hawaii.

There is continuing concern for the historic sites of the County of Hawaii on the part of residents, governmental agencies, and private developers. It is realized that once destroyed, historic sites and the information which they contain cannot be replaced. As the early history of Hawaii was kept through oral tradition, the reconstruction of this period is to a large extent based on the physical evidence of sites. Many landowners are becoming aware that Hawaiian artifacts used in daily living are being removed from their lands for or by collectors. Consequently sites have been despoiled and information regarding the function of site itself and the artifacts have been destroyed. Increased land development and the prices being paid for artifacts by collectors endanger many historic sites.

It is important to recognize that the history of this island is the history of those who live here. Public access to major historic sites has not always been available, and the information derived from sites and its significance have not always been distributed.

The State's Historic Preservation Division in the Department of Land and Natural Resources is charged with a variety of tasks within the State's historic preservation program. It keeps an inventory of known historic sites and promotes surveys to identify and document new sites. It also has a program element to place significant sites on the Hawaii Register of Historic Places and also coordinates the nomination of sites to the National Register of Historic Places.

Archaeological investigations continue to be conducted on the island of Hawaii, adding to the list of known sites. These investigations as well as cultural and historical research are important in identifying significant cultural resources and helping to provide the basis for their protection and management.

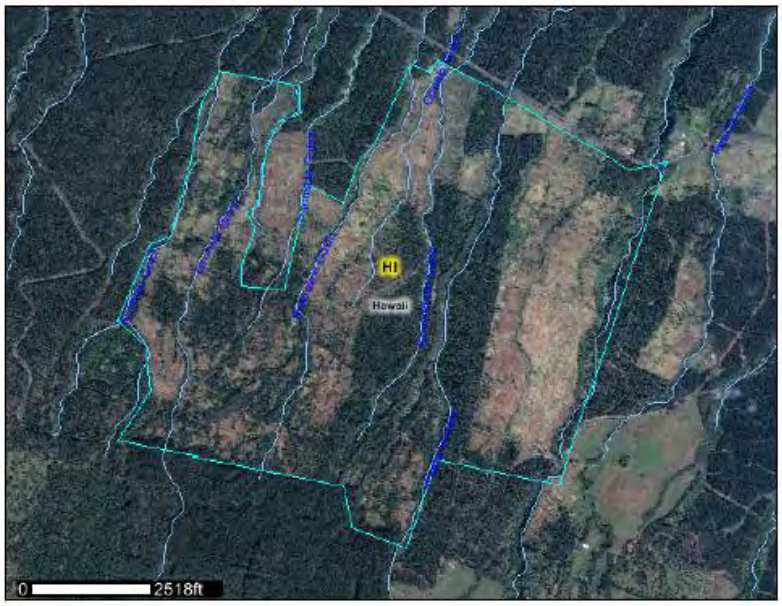
Mauna Kea Moo LLC should invite the University of Hawaii at Hilo and/or the North Hawaii Heritage Center to conduct field surveys of the valleys along with further documentation of the plantation lifestyle.

United States Department of Agriculture

NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Island of Hawaii Area, Hawaii



August 30, 2010

Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app? agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/ state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

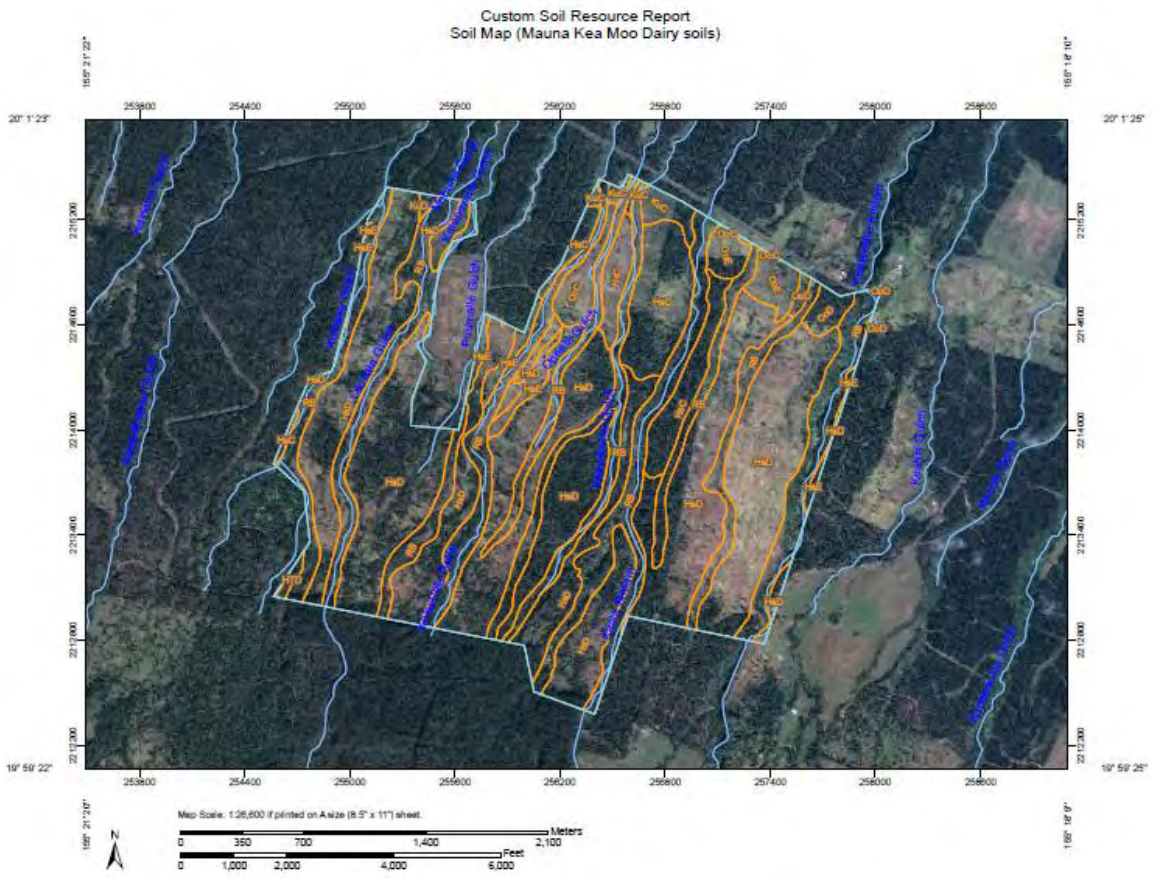
While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

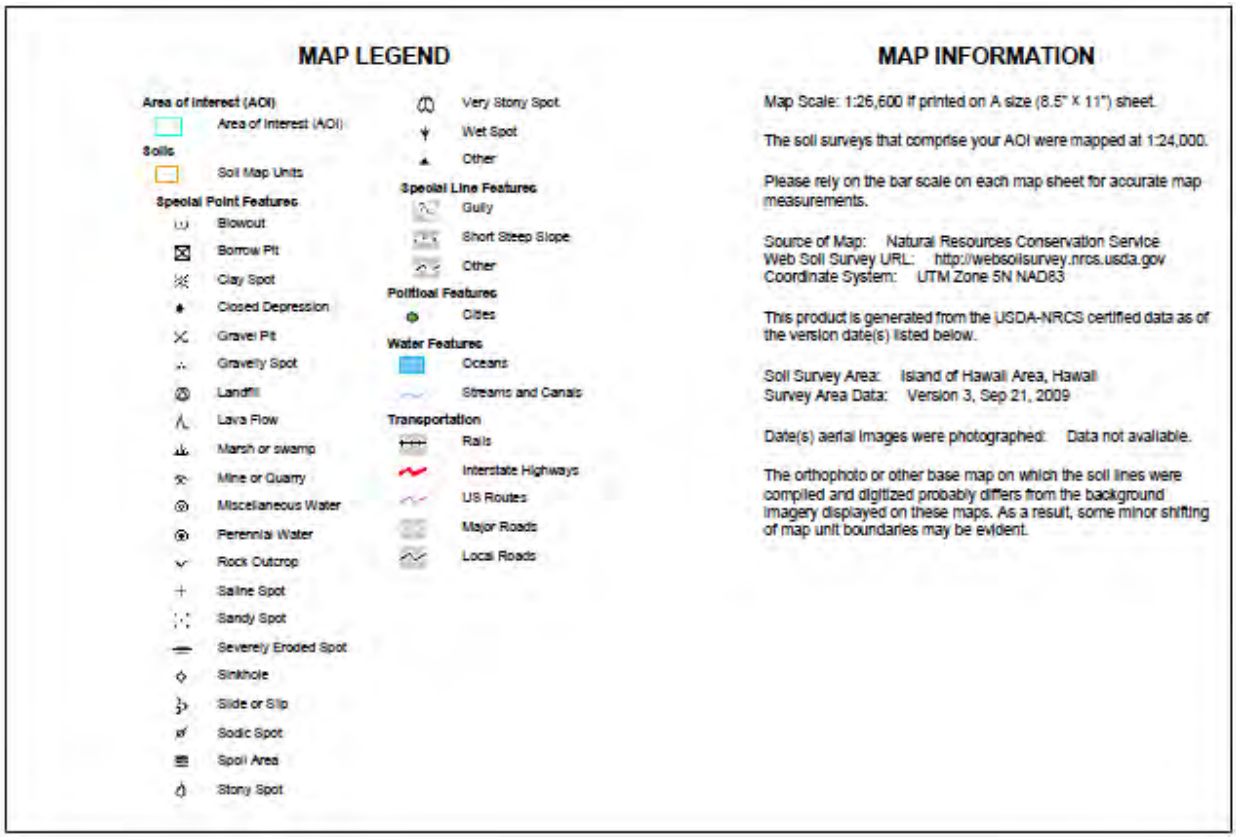
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.




MAP LEGEND
Area of Interest (AOI)
Area of Interest (AOI)
Soils
Soil Map Units
Special Point Features
Blowout
Borrow Pit
Clay Spot
Closed Depression
Gravel Pit
Gravelly Spot
Landfill
Lava Flow
Marsh or swamp
Mine or Quarry
Miscellaneous Water
Perennial Water
Rock Outcrop
Saline Spot
Sandy Spot
Severely Eroded Spot
Sinkhole
Slide or Slip
Sodic Spot
Spoil Area
Stony Spot
Very Stony Spot
Wet Spot
Other
Special Line Features
Gully
Short Steep Slope
Other
Political Features
Cities
Water Features
Oceans
Streams and Canals
Transportation
Rails
Interstate Highways
US Routes
Major Roads
Local Roads
MAP INFORMATION
Map Scale: 1:26,600 if printed on A size (8.5" X 11") sheet.
The soil surveys that comprise your AOI were mapped at 1:24,000.
Please rely on the bar scale on each map sheet for accurate map measurements.
Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 5N NAD83
This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.
Soil Survey Area: Island of Hawaii Area, Hawaii
Survey Area Data: Version 3, Sep 21, 2009
Date(s) aerial images were photographed: Data not available.
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Mauna Kea Moo Dairy soils)

Island of Hawaii Area, Hawaii (HI801)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
HsC	Honokaa silty clay loam, low elevation, 0 to 10 percent slopes	132.0	8.2%
HsD	Honokaa silty clay loam, low elevation, 10 to 20 percent slopes	867.0	54.1%
HsE	Honokaa silty clay loam, low elevation, 20 to 35 percent slopes	29.1	1.8%
HTD	Honokaa silty clay loam, 10 to 20 percent slopes	3.2	0.2%
KuC	Kukalau silty clay loam, 6 to 12 percent slopes	18.7	1.2%
KuD	Kukalau silty clay loam, 12 to 20 percent slopes	2.4	0.1%
OoC	Ookala silty clay loam, 6 to 12 percent slopes	23.0	1.4%
OoD	Ookala silty clay loam, 12 to 20 percent slopes	16.2	1.0%
OoE	Ookala silty clay loam, 20 to 35 percent slopes	30.7	1.9%
RB	Rough broken land	479.7	29.9%
Totals for Area of Interest		**1,602.0**	**100.0%**

Map Unit Descriptions (Mauna Kea Moo Dairy soils)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called no contrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas.* Such are as have little or no soil material and support little or no vegetation. Rock outcrop is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example. Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Island of Hawaii Area, Hawaii

HsC—Honokaa silty clay loam, low elevation, 0 to 10 percent slopes

Map Unit Setting

Elevation: 1,000 to 3,000 feet
Mean annual precipitation: 100 to 150 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 365 days

Map Unit Composition

Honokaa and similar soils: 100 percent

Description of Honokaa

Setting

Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear *Across-slope shape:* Convex
Parent material: Volcanic ash

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None *Frequency of ponding:* None
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups

Land capability (nonirrigated): 3e

Typical profile

0 to 6 inches: Silty clay loam
6 to 65 inches: Silty clay loam

HsD—Honokaa silty clay loam, low elevation, 10 to 20 percent slopes

Map Unit Setting

Elevation: 1,000 to 3,000 feet
Mean annual precipitation: 100 to 150 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 365 days

Map Unit Composition

Honokaa and similar soils: 100 percent

Description of Honokaa

Setting

Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear *Across-slope shape:* Convex
Parent material: Volcanic ash

Properties and qualities

Slope: 10 to 20 percent *Depth to restrictive feature:* More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches *Frequency of flooding:* None
Frequency of ponding: None *Available water capacity:* Moderate (about 7.8 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 6 inches: Silty clay loam *6 to 65 inches:* Silty clay loam

HsE—Honokaa silty clay loam, low elevation, 20 to 35 percent slopes

Map Unit Setting

Elevation: 1,000 to 3,000 feet
Mean annual precipitation: 100 to 150 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 365 days

Map Unit Composition

Honokaa and similar soils: 100 percent

Description of Honokaa

Setting

Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Volcanic ash

Properties and qualities

Slope: 20 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups

Land capability (nonirrigated): 6e

Typical profile

0 to 6 inches: Silty clay loam
6 to 65 inches: Silty clay loam

HTD—Honokaa silty clay loam, 10 to 20 percent slopes

Map Unit Setting

Elevation: 1,000 to 3,000 feet
Mean annual precipitation: 100 to 150 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 365 days

Map Unit Composition

Honokaa and similar soils: 100 percent

Description of Honokaa

Setting

Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear *Across-slope shape:* Convex
Parent material: Volcanic ash

Properties and qualities

Slope: 10 to 20 percent *Depth to restrictive feature:* More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.8 inches)

Interpretive groups

Land capability (nonirrigated): 4e
Ecological site: Acacia koa-Metrosideros polymorpha/Cibotium menziesii/ Freycinetia arborea (F159AY500HI)

Typical profile

0 to 6 inches: Silty clay loam *6 to 65 inches:* Silty clay loam

KuC—Kukaiau silty clay loam, 6 to 12 percent slopes

Map Unit Setting

Elevation: 500 to 1,500 feet
Mean annual precipitation: 70 to 100 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 365 days

Map Unit Composition

Kukaiau and similar soils: 100 percent

Description of Kukaiau Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Volcanic ash

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 48 to 75 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.5 inches)

Interpretive groups

Land capability (nonirrigated): 3e

Typical profile

0 to 10 inches: Silty clay loam
10 to 38 inches: Silty clay loam
38 to 50 inches: Extremely gravelly silty clay loam
50 to 60 inches: Bedrock

KuD—Kukaiau silty clay loam, 12 to 20 percent slopes

Map Unit Setting

Elevation: 500 to 1,500 feet
Mean annual precipitation: 70 to 100 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 365 days

Map Unit Composition

Kukaiau and similar soils: 100 percent

Description of Kukaiau Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Volcanic ash

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: 48 to 75 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.5 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 10 inches: Silty clay loam
10 to 38 inches: Silty clay loam
38 to 50 inches: Extremely gravelly silty clay loam
50 to 60 inches: Bedrock

OoC—Ookala silty clay loam, 6 to 12 percent slopes

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual precipitation: 90 to 120 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Ookala and similar soils: 100 percent

Description of Ookala Setting

Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Volcanic ash

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None *Available water capacity:* Moderate (about 8.5 inches)

Interpretive groups

Land capability (nonirrigated): 3e

Typical profile

0 to 12 inches: Silty clay loam
12 to 55 inches: Silty clay loam
55 to 60 inches: Extremely cobbly material

OoD—Ookala silty clay loam, 12 to 20 percent slopes

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual precipitation: 90 to 120 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Ookala and similar soils: 100 percent

Description of Ookala Setting

Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Volcanic ash

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately

high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.5 inches)

Interpretive groups

Land capability (nonirrigated): 4e

Typical profile

0 to 12 inches: Silty clay loam
12 to 55 inches: Silty clay loam
55 to 60 inches: Extremely cobbly material

OoE—Ookala silty clay loam, 20 to 35 percent slopes

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual precipitation: 90 to 120 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Ookala and similar soils: 100 percent

Description of Ookala Setting

Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear *Across-slope shape:* Concave
Parent material: Volcanic ash

Properties and qualities

Slope: 20 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.5 inches)

Interpretive groups

Land capability (nonirrigated): 6e

Typical profile

0 to 12 inches: Silty clay loam
12 to 55 inches: Silty clay loam
55 to 60 inches: Extremely cobbly material

RB—Rough broken land

Map Unit Setting

Elevation: 0 to 3,000 feet
Mean annual precipitation: 50 to 150 inches
Mean annual air temperature: 64 to 72 degrees F
Frost-free period: 365 days

Map Unit Composition

Rough broken land and similar soils: 100 percent

Description of Rough Broken Land Setting

Landform: Gulches
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, rise
Down-slope shape: Linear *Across-slope shape:* Convex
Parent material: Alluvium and colluvium

Properties and qualities

Slope: 35 to 70 percent
Depth to restrictive feature: 15 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Land capability (nonirrigated): 7e

Typical profile

0 to 10 inches: Silty clay loam
10 to 30 inches: Silty clay loam
30 to 60 inches: Bedrock

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The Reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

AOI Inventory

This folder contains a collection of tabular reports that present a variety of soil information. Included are various map unit description reports, special soil interpretation reports, and data summary reports.

Component Legend (Mauna Kea Moo Dairy)

This report presents general information about the map units and map unit components in the selected area. It shows map unit symbols and names and the components in each map unit. It also shows the percent of the components in the map units, the kind of component, and the slope range of each component.

Report—Component Legend (Mauna Kea Moo Dairy)

Component Legend– Island of Hawaii Area, Hawaii						
Map unit symbol and name	Pct. of map unit	Component name	Component kind	Pct. slope		
				Low	RV	High
HsC—Honokaa silty clay loam, low elevation, 0 to 10 percent slopes						
	100	Honokaa	Series	0	5	10
HsD—Honokaa silty clay loam, low elevation, 10 to 20 percent slopes						
	100	Honokaa	Series	10	15	20
HsE—Honokaa silty clay loam, low elevation, 20 to 35 percent slopes						
	100	Honokaa	Series	20	28	35
HTD—Honokaa silty clay loam, 10 to 20 percent slopes						
	100	Honokaa	Series	10	15	20
KuC—Kukalau silty clay loam, 6 to 12 percent slopes						
	100	Kukalau	Series	6	9	12

Component Legend– Island of Hawaii Area, Hawaii						
Map unit symbol and name	Pct. of map unit	Component name	Component kind	Pct. slope		
				Low	RV	High
KuD—Kukalau silty clay loam, 12 to 20 percent slopes						
	100	Kukalau	Series	12	16	20
OoC—Ookala silty clay loam, 6 to 12 percent slopes						
	100	Ookala	Series	6	9	12
OoD—Ookala silty clay loam, 12 to 20 percent slopes						
	100	Ookala	Series	12	16	20
OoE—Ookala silty clay loam, 20 to 35 percent slopes						
	100	Ookala	Series	20	28	35
RB—Rough broken land						
	100	Rough broken land	Taxon above family	35	53	70

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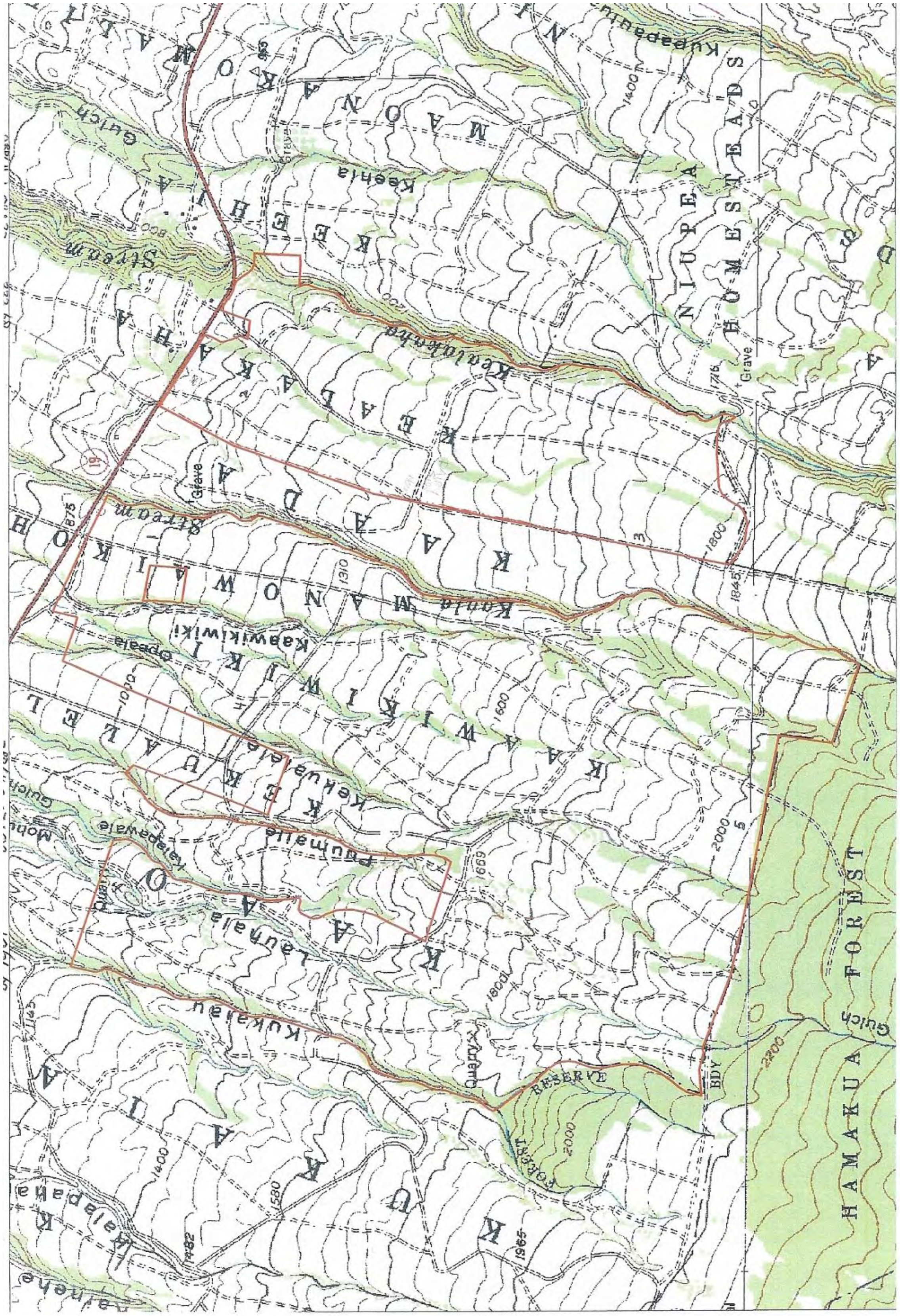
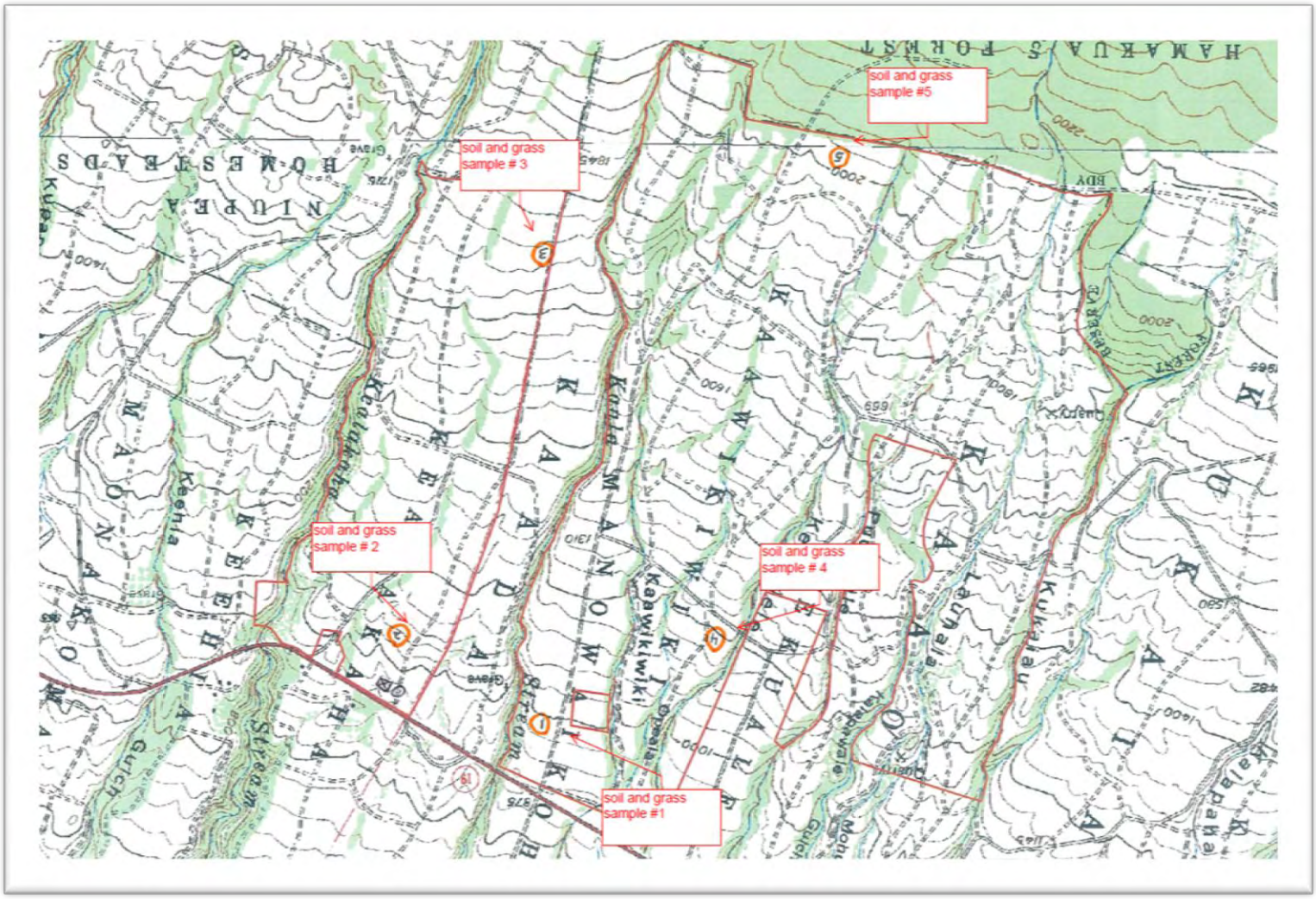


TOPOGRAPHY MAP

Soil Sample Map



CTAHR
College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa

Soil/Plant Analysis Report

Agricultural Diagnostic Service Center
Department of Agronomy and Soil Science
1910 East-West Road, Honolulu, HI 96822
Ph: (808) 956-6706/7980 FAX: (808) 956-2592
Email: adsc@ctahr.hawaii.edu

Date Reported: 10/18/2010

Client: DUPONTE, MICHAEL W.
CES, 875 KOMOHANA ST.
HILO, HI 96720

Agent: NO AGENT, Office: NONE
NONE
NONE, NONE NONE
, Fax:

Sample Information

Job Control No:	11-044919-001	Map Unit:		Plant Grown:	OTHER CROP
Sample Label:	1	Soil Series:		Plant to be grown:	OTHER CROP
Date Received:	9/22/2010	Soil Category:	LIGHT SOIL	Can you till 4~6 in.?	Yes
Send Copy To		Soil Depth (in):		Test Results Only?	No
Elevation (ft.):		Latitude:		Longitude:	

Test Results and Interpretation

LIGHT SOIL

Soil Analysis	Results	Expected	INTERPRETATION: Very Low / Low / Sufficient / High / Very High
_pH	5.7	6.15	
P_ppm	35	67.5	
K_ppm	66	300	
Ca_ppm	42	3500	
Mg_ppm	27	700	
OC_%		No criteria found	
Total_N_%		No criteria found	
Salinity_EC		1.25	
S_ppm		No criteria found	
Fe_ppm	37	No criteria found	
Mn_ppm	7.7	No criteria found	
Zn_ppm	1.2	No criteria found	
Cu_ppm	2	No criteria found	
B_ppm		No criteria found	
Mo_ppm		No criteria found	
Al_ppm		No criteria found	

OTHER CROP

Plant Analysis	Results	Expected	INTERPRETATION: Very Low / Low / Sufficient / High / Very High
N_%		No criteria found	
P_%		No criteria found	
K_%		No criteria found	
Ca_%		No criteria found	
Mg_%		No criteria found	
S_%		No criteria found	
Fe_ppm		No criteria found	
Mn_ppm		No criteria found	
Zn_ppm		No criteria found	
Cu_ppm		No criteria found	
B_ppm		No criteria found	
Mo_ppm		No criteria found	
Al_ppm		No criteria found	
NO3_ppm		No criteria found	

Job Control No: 11-044919-001

Problem Description

OTHER PLANT TO BE GROWN: IMPROVED PASTURE.

Fertilizer and Lime Recommendations

Total Nutrient Requirement (lbs/Acre):		Nitrogen: 150	Phosphorus: 100	Potassium: 250
Fertilizer / Lime Material		Total Amount (lbs/Acre)	Applications	Cost Estimate ($/Acre)
Fertilizer:	10-20-20	1506	split into 2 applns.	271
Lime Material:	Coral Limestone	4191	split into 4 applns.	922
Mg Material:	Mg-Sulfate	2500	split into 4 applns.	1000

Comments

---- GENERAL INFORMATION ----

o Please indicate the soil series when submitting your soil samples.

o Knowing levels of sulfur and micronutrients in plants is also important. For proper diagnosis, tissue analysis is needed.

o Split and apply the total amount of lime at 3 months inteval..

o Split the fertilizer into several applications, once every 6 months until the total amount has been applied.

o We recommend that you adopt a nutrient monitoring approach by retaining this sample report for comparison with future samples.

NOTE:

The interpretations are based on Fact Sheet No. 3 "Adequate Nutrient Levels in Soils and Plants in Hawaii."
To help improve future recommendations, please answer the following questions, photocopy this form and return it to above address.
1. Did you need to modify the recommendation? if so, how?
2. Did your plants improve? Please give unit area yield before and after the recommendation was applied.

FEEDBACK

CTAHR
College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa

Soil/Plant Analysis Report

Agricultural Diagnostic Service Center
Department of Agronomy and Soil Science
1910 East-West Road, Honolulu, HI 96822
Ph: (808) 956-6706/7980 FAX: (808) 956-2592
Email: adsc@ctahr.hawaii.edu

Date Reported: 10/18/2010

Client: DUPONTE, MICHAEL W.
CES, 875 KOMOHANA ST.
HILO, HI 96720

Agent: NO AGENT, Office: NONE
NONE
NONE, NONE NONE
, Fax:

Sample Information

Job Control No:	11-044919-002	Map Unit:		Plant Grown:	OTHER CROP
Sample Label:	2	Soil Series:		Plant to be grown:	OTHER CROP
Date Received:	9/22/2010	Soil Category:	LIGHT SOIL	Can you till 4~6 in.?	Yes
Send Copy To		Soil Depth (in):		Test Results Only?	No
Elevation (ft.):		Latitude:		Longitude:	

Test Results and Interpretation

LIGHT SOIL

Soil Analysis	Results	Expected	INTERPRETATION: Very Low | Low | Sufficient | High | Very High
_pH	5.4	6.15	
P_ppm	21	67.5	
K_ppm	62	300	
Ca_ppm	49	3500	
Mg_ppm	16	700	
OC_%		No criteria found	
Total_N_%		No criteria found	
Salinity_EC		1.25	
S_ppm		No criteria found	
Fe_ppm	65	No criteria found	
Mn_ppm	1.6	No criteria found	
Zn_ppm	0.32	No criteria found	
Cu_ppm	1.5	No criteria found	
B_ppm		No criteria found	
Mo_ppm		No criteria found	
Al_ppm		No criteria found	

OTHER CROP

Plant Analysis	Results	Expected	INTERPRETATION: Very Low | Low | Sufficient | High | Very High
N_%		No criteria found	
P_%		No criteria found	
K_%		No criteria found	
Ca_%		No criteria found	
Mg_%		No criteria found	
S_%		No criteria found	
Fe_ppm		No criteria found	
Mn_ppm		No criteria found	
Zn_ppm		No criteria found	
Cu_ppm		No criteria found	
B_ppm		No criteria found	
Mo_ppm		No criteria found	
Al_ppm		No criteria found	
NO3_ppm		No criteria found	

Job Control No: 11-044919-002

Problem Description

OTHER PLANT TO BE GROWN: IMPROVED PASTURE.

Fertilizer and Lime Recommendations

Total Nutrient Requirement (lbs/Acre):		Nitrogen: 150	Phosphorus: 329	Potassium: 286
Fertilizer / Lime	Material	Total Amount (lbs/Acre)	Applications	Cost Estimate ($/Acre)
Fertilizer:	10-20-20	1723	split into 2 applns.	310
Lime Material:	Coral Limestone	4969	split into 4 applns.	1093
Mg Material:	Mg-Sulfate	2500	split into 4 applns.	1000

Comments

---- GENERAL INFORMATION ----

o Please indicate the soil series when submitting your soil samples.

o Knowing levels of sulfur and micronutrients in plants is also important. For proper diagnosis, tissue analysis is needed.

o Split and apply the total amount at 3 months interval..

o Split the fertilizer into several applications, once every 6 month until the total amount has been applied.

o We recommend that you adopt a nutrient monitoring approach by retaining this sample report for comparison with future samples.

NOTE:

The interpretations are based on Fact Sheet No. 3 "Adequate Nutrient Levels in Soils and Plants in Hawaii."
To help improve future recommendations, please answer the following questions, photocopy this form and return it to above address.
1. Did you need to modify the recommendation? if so, how?
2. Did your plants improve? Please give unit area yield before and after the recommendation was applied.

FEEDBACK

CTAHR
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Soil/Plant Analysis Report

Agricultural Diagnostic Service Center
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Ph: (808) 956-6706/7980 FAX: (808) 956-2592
Email: adsc@ctahr.hawaii.edu

Date Reported: 10/18/2010

Client: DUPONTE, MICHAEL W.
CES, 875 KOMOHANA ST.
HILO, HI 96720

Agent: NO AGENT, Office: NONE
NONE
NONE, NONE NONE
, Fax:

Sample Information

Job Control No:	11-044919-003	Map Unit:		Plant Grown:	OTHER CROP
Sample Label:	3	Soil Series:		Plant to be grown:	OTHER CROP
Date Received:	9/22/2010	Soil Category:	LIGHT SOIL	Can you till 4~6 in.?	Yes
Send Copy To		Soil Depth (in):		Test Results Only?	No
Elevation (ft.):		Latitude:		Longitude:	

Test Results and Interpretation

LIGHT SOIL

Soil Analysis	Results	Expected	INTERPRETATION: Very Low	Low	Sufficient	High	Very High
_pH	5.4	6.15					
P_ppm	41	67.5					
K_ppm	42	300					
Ca_ppm	19	3500					
Mg_ppm	18	700					
OC_%		No criteria found					
Total_N_%		No criteria found					
Salinity_EC		1.25					
S_ppm		No criteria found					
Fe_ppm	72	No criteria found					
Mn_ppm	8.3	No criteria found					
Zn_ppm	1	No criteria found					
Cu_ppm	2.1	No criteria found					
B_ppm		No criteria found					
Mo_ppm		No criteria found					
Al_ppm		No criteria found					

OTHER CROP

Plant Analysis	Results	Expected	INTERPRETATION: Very Low	Low	Sufficient	High	Very High
N_%		No criteria found					
P_%		No criteria found					
K_%		No criteria found					
Ca_%		No criteria found					
Mg_%		No criteria found					
S_%		No criteria found					
Fe_ppm		No criteria found					
Mn_ppm		No criteria found					
Zn_ppm		No criteria found					
Cu_ppm		No criteria found					
B_ppm		No criteria found					
Mo_ppm		No criteria found					
Al_ppm		No criteria found					
NO3_ppm		No criteria found					

Job Control No: 11-044919-003

Problem Description

OTHER PLANT TO BE GROWN: IMPROVED PASTURE.

Fertilizer and Lime Recommendations

Total Nutrient Requirement (lbs/Acre):		Nitrogen: 150	Phosphorus: 100	Potassium: 250
Fertilizer / Lime Material		Total Amount (lbs/Acre)	Applications	Cost Estimate ($/Acre)
Fertilizer:	10-20-20	1506	split into 2 applns.	271
Lime Material:	Coral Limestone	4969	split into 4 applns.	1093
Mg Material:	Mg-Sulfate	2500	split into 4 applns.	1000

Comments

---- GENERAL INFORMATION ----

o Please indicate the soil series when submitting your soil samples.

o Knowing levels of sulfur and micronutrients in plants is also important. For proper diagnosis, tissue analysis is needed.

o Split and apply the total amount of lime at 3 months interval..

o Split the fertilizer into several applications, once every 6 months until the total amount has been applied.

o We recommend that you adopt a nutrient monitoring approach by retaining this sample report for comparison with future samples.

NOTE:

The interpretations are based on Fact Sheet No. 3 "Adequate Nutrient Levels in Soils and Plants in Hawaii."
To help improve future recommendations, please answer the following questions, photocopy this form and return it to above address.
1. Did you need to modify the recommendation? if so, how?
2. Did your plants improve? Please give unit area yield before and after the recommendation was applied.

FEEDBACK

CTAHR
College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa

Soil/Plant Analysis Report

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Ph: (808) 956-6706/7980 FAX: (808) 956-2592
Email: adsc@ctahr.hawaii.edu

Date Reported: 10/18/2010

Client: DUPONTE, MICHAEL W.
CES, 875 KOMOHANA ST.
HILO, HI 96720

Agent: NO AGENT, Office: NONE
NONE
NONE, NONE NONE
, Fax:

Sample Information

Job Control No:	11-044919-004	Map Unit:		Plant Grown:	OTHER CROP
Sample Label:	4	Soil Series:		Plant to be grown:	OTHER CROP
Date Received:	9/22/2010	Soil Category:	LIGHT SOIL	Can you till 4~6 in.?	Yes
Send Copy To		Soil Depth (in):		Test Results Only?	No
Elevation (ft.):		Latitude:		Longitude:	

Test Results and Interpretation

LIGHT SOIL — **INTERPRETATION**

Soil Analysis	Results	Expected	Very Low	Low	Sufficient	High	Very High
_pH	5.3	6.15					
P_ppm	24	67.5					
K_ppm	33	300					
Ca_ppm	10	3500					
Mg_ppm	10	700					
OC_%		No criteria found					
Total_N_%		No criteria found					
Salinity_EC		1.25					
S_ppm		No criteria found					
Fe_ppm	43	No criteria found					
Mn_ppm	2.7	No criteria found					
Zn_ppm	0.44	No criteria found					
Cu_ppm	1.5	No criteria found					
B_ppm		No criteria found					
Mo_ppm		No criteria found					
Al_ppm		No criteria found					

OTHER CROP — **INTERPRETATION**

Plant Analysis	Results	Expected	Very Low	Low	Sufficient	High	Very High
N_%		No criteria found					
P_%		No criteria found					
K_%		No criteria found					
Ca_%		No criteria found					
Mg_%		No criteria found					
S_%		No criteria found					
Fe_ppm		No criteria found					
Mn_ppm		No criteria found					
Zn_ppm		No criteria found					
Cu_ppm		No criteria found					
B_ppm		No criteria found					
Mo_ppm		No criteria found					
Al_ppm		No criteria found					
NO3_ppm		No criteria found					

Job Control No: 11-044919-004

Problem Description

OTHER PLANT TO BE GROWN: IMPROVED PASTURE.

Fertilizer and Lime Recommendations

Total Nutrient Requirement (lbs/Acre):		Nitrogen: 150	Phosphorus: 100	Potassium: 200
Fertilizer / Lime Material		Total Amount (lbs/Acre)	Applications	Cost Estimate ($/Acre)
Fertilizer:	10-20-20	1500	split into 2 applns.	270
Lime Material:	Coral Limestone	5192	split into 4 applns.	1142
Mg Material:	Mg-Sulfate	2500	split into 4 applns.	1000

Comments

---- GENERAL INFORMATION ----

o Please indicate the soil series when submitting your soil samples.

o Knowing levels of sulfur and micronutrients in plants is also important. For proper diagnosis, tissue analysis is needed.

o split and apply the total amount of lime at 3 months interval..

o Split the fertilizer into several applications , once every 6 months until the total amount has been applied.

o We recommend that you adopt a nutrient monitoring approach by retaining this sample report for comparison with future samples.

NOTE:

The interpretations are based on Fact Sheet No. 3 "Adequate Nutrient Levels in Soils and Plants in Hawaii."
To help improve future recommendations, please answer the following questions, photocopy this form and return it to above address.
1. Did you need to modify the recommendation? if so, how?
2. Did your plants improve? Please give unit area yield before and after the recommendation was applied.

FEEDBACK

CTAHR
College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa

Soil/Plant Analysis Report

Agricultural Diagnostic Service Center
Department of Agronomy and Soil Science
1910 East-West Road, Honolulu, HI 96822
Ph: (808) 956-6706/7980 FAX: (808) 956-2592
Email: adsc@ctahr.hawaii.edu

Date Reported: 10/18/2010

Client: DUPONTE, MICHAEL W.
CES, 875 KOMOHANA ST.
HILO, HI 96720

Agent: NO AGENT, Office: NONE
NONE
NONE, NONE NONE
, Fax:

Sample Information

Job Control No:	11-044919-005	Map Unit:		Plant Grown:	OTHER CROP
Sample Label:	5	Soil Series:		Plant to be grown:	OTHER CROP
Date Received:	9/22/2010	Soil Category:	LIGHT SOIL	Can you till 4~6 in.?	Yes
Send Copy To		Soil Depth (in):		Test Results Only?	No
Elevation (ft.):		Latitude:		Longitude:	

Test Results and Interpretation

LIGHT SOIL

Soil Analysis	Results	Expected	INTERPRETATION: Very Low	Low	Sufficient	High	Very High
_pH	5.6	6.15					
P_ppm	33	67.5					
K_ppm	66	300					
Ca_ppm	57	3500					
Mg_ppm	60	700					
OC_%		No criteria found					
Total_N_%		No criteria found					
Salinity_EC		1.25					
S_ppm		No criteria found					
Fe_ppm	58	No criteria found					
Mn_ppm	7.3	No criteria found					
Zn_ppm	0.92	No criteria found					
Cu_ppm	2	No criteria found					
B_ppm		No criteria found					
Mo_ppm		No criteria found					
Al_ppm		No criteria found					

OTHER CROP

Plant Analysis	Results	Expected	INTERPRETATION: Very Low	Low	Sufficient	High	Very High
N_%		No criteria found					
P_%		No criteria found					
K_%		No criteria found					
Ca_%		No criteria found					
Mg_%		No criteria found					
S_%		No criteria found					
Fe_ppm		No criteria found					
Mn_ppm		No criteria found					
Zn_ppm		No criteria found					
Cu_ppm		No criteria found					
B_ppm		No criteria found					
Mo_ppm		No criteria found					
Al_ppm		No criteria found					
NO3_ppm		No criteria found					

Job Control No: 11-044919-005

Problem Description

OTHER PLANT TO BE GROWN: IMPROVED PASTURE.

Fertilizer and Lime Recommendations

Total Nutrient Requirement (lbs/Acre):		Nitrogen: 150	Phosphorus: 245	Potassium: 281
Fertilizer / Lime Material		Total Amount (lbs/Acre)	Applications	Cost Estimate ($/Acre)
Fertilizer:	10-20-20	1500	split into 2 applns.	270
Lime Material:	Coral Limestone	4472	split into 4 applns.	984
Mg Material:	Mg-Sulfate	1750	split into 4 applns.	700

Comments

---- GENERAL INFORMATION ----

o Please indicate the soil series when submitting your soil samples.

o Knowing levels of sulfur and micronutrients in plants is also important. For proper diagnosis, tissue analysis is needed.

o Split and apply the total amount of lime at 3 month interval.

o Split the fertilizer into several applications, once every 6 months until the total amount has been applied.

o We recommend that you adopt a nutrient monitoring approach by retaining this sample report for comparison with future samples.

NOTE:

The interpretations are based on Fact Sheet No. 3 "Adequate Nutrient Levels in Soils and Plants in Hawaii."
To help improve future recommendations, please answer the following questions, photocopy this form and return it to above address.
1. Did you need to modify the recommendation? if so, how?
2. Did your plants improve? Please give unit area yield before and after the recommendation was applied.

FEEDBACK

GRASS SAMPLES

GRASS SAMPLE TEST RESULTS

Agricultural Diagnostic Service Center
University of Hawaii, Manoa
1910 East-West Road
G. Donald Sherman Laboratory, Room 134
Honolulu, Hawaii 96822

SOIL SAMPLE ANALYSES WORKSHEET

JCNO:11-044919	RECEIVED: 10/4/10	SAMPLE TYPE			CAT/COMMON NAME:	
CLIENT ID:	COMPLETED: 10/12	[ ] PLANT TISSUE		REASON:		[ ] OTHER
CLIENT:	Michael Duponte	CROP:		PROBLEM [ ]	COLLECTED:	MATERIAL:
ATTN:		VARIETY:		MONITOR [ ]	COMPLETED:	
ADDRESS:		AGE:		SURVEY [ ]	COLLECTOR:	
CITY		TISSUE:		EXP. [ ]	SITE:	
PHONE:	TOTAL SAMPLE: 5			OTHER:		
		SOIL SUBMITTED: [ ] YES [ ] NO				

ITEM	Sample Lab No.	Description	Anal. Code	ug/g As	Cd	Co	Cr	Cu	Ni	Pb	Se	Zn	ug/g
1	101-3627	Hawaii Dutch Dairy 1	S7	6.01	0.67	9.28	139.52	57.38	13.00	2.73	9.83	56.89	
2	101-3628	Hawaii Dutch Dairy 2		2.01	0.73	0.99	187.26	55.91	29.15	4.63	7.81	38.54	
3	101-3629	Hawaii Dutch Dairy 3		6.22	0.88	0.18	185.63	42.44	5.17	2.74	6.10	52.06	
4	101-3630	Hawaii Dutch Dairy 4		6.75	1.06	0.19	179.67	36.98	8.19	2.93	4.55	41.42	
5	101-3631	Hawaii Dutch Dairy 5		1.40	0.85	0.03	190.60	52.96	9.73	3.14	2.87	53.22	
6													
7													
8													
9													

As the above soil and grass test results show, the soil is depleted of nutrients. It will take time and management to bring the pastures up to production levels to support dairy animals.

Hamakua Soil & Water Conservation District

Minutes September 29, 2010

Meeting was held at the Hilo Lagoon Center

Present: Thomas Young Chair, Directors Mike Robinson, Michael Surprenant present Noel Ide District Planner, Jessica Newpher and Matthew Wung NRCS Conservationist Hilo and Waimea field offices.

Meeting called to order 12:30 PM.

Minutes of August meetings approved and filed. With Statement of potential conflict of interest by member Mike Robinson. The August minutes will be amended to reflect his statement

Treasures Report approved and filed.

New Cooperator: Kees & Malena Kea
Neal Nakamoto

Plan Approval: None

Plan Revision: Robert Culbertson
Vicki Dunaway

Plan Updates: None

Plan Cancellations: None

Subdivision Reviews: None

Next meeting; October 27, 2010

Meeting adjourned: 1:30 PM

P.O. Box 31 Papaaloa, Hawaii 96780

Jerseys

Holsteins

ProFormance™

SwingOver™ Milking Parlor System

An economically efficient milking parlor solution

- Automated milk-start (activates detacher automatically).
- Unsurpassed milking technology for proper alignment and milkout.
- Optimal operator comfort.
- Parlor packages to fit your management.

WestfaliaSurge

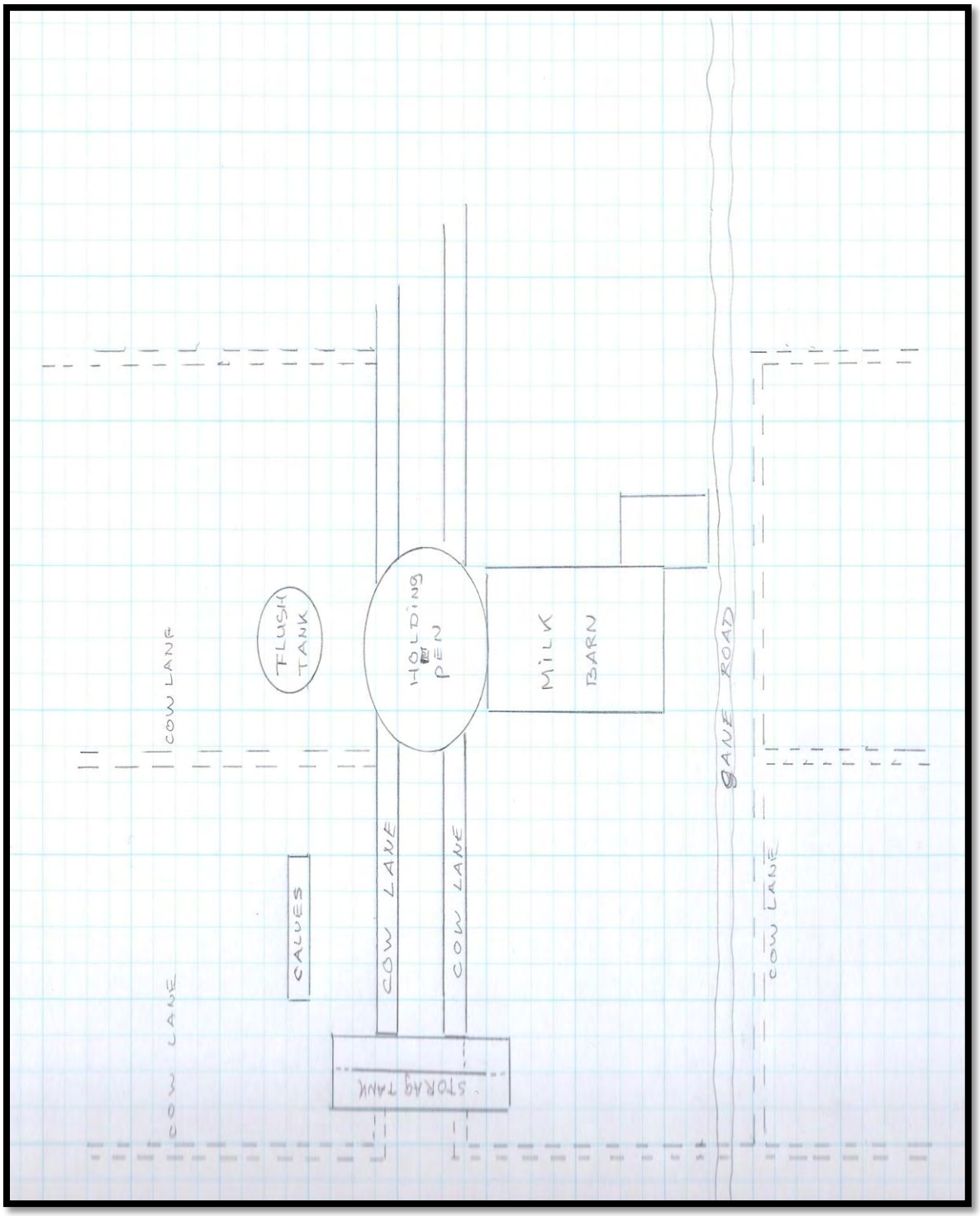
Two compartment underground manure storage

Removable Agitator.

Removable Agitator.

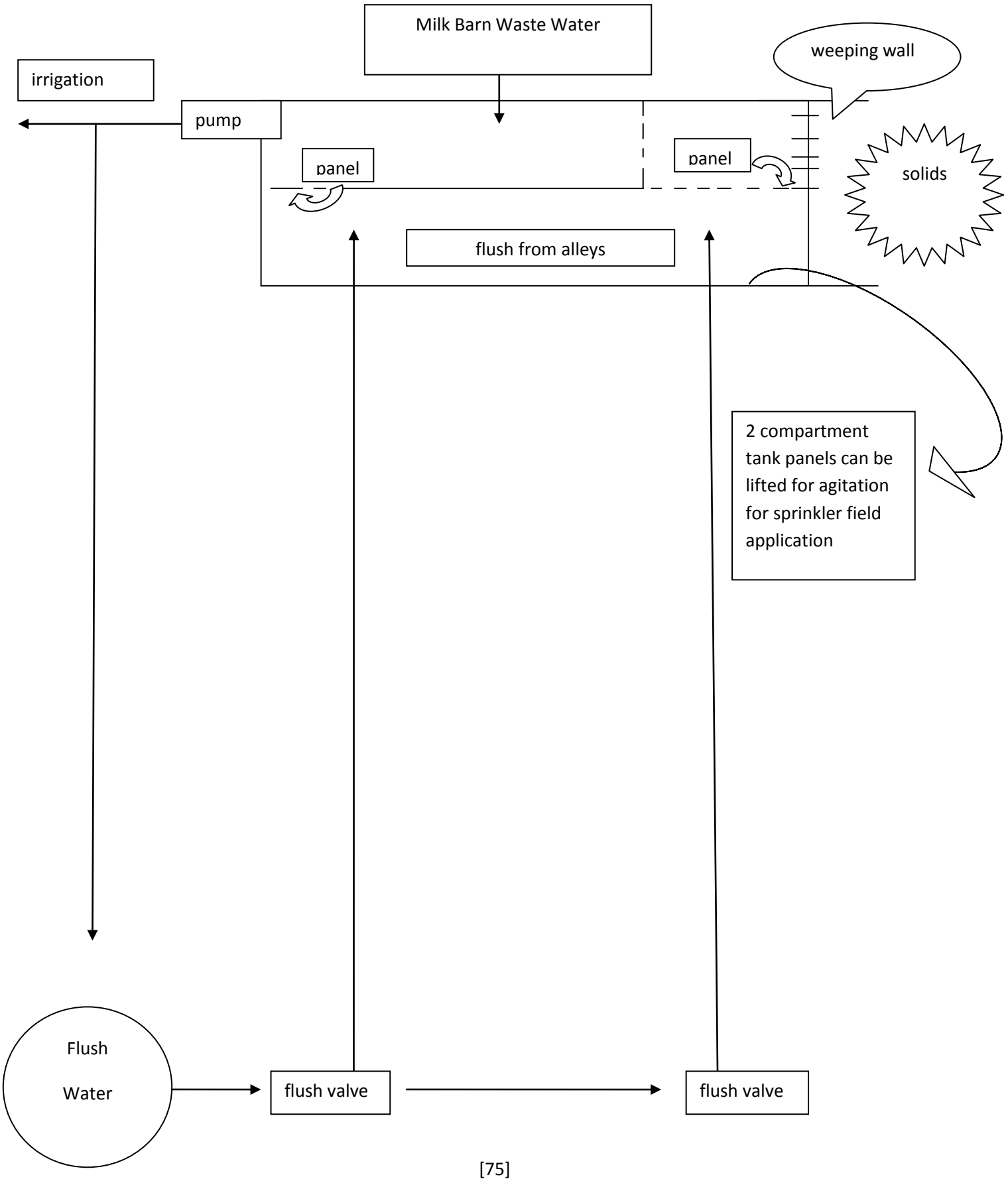
Ramp for cleanout.

Proposed Layout of Dairy Site



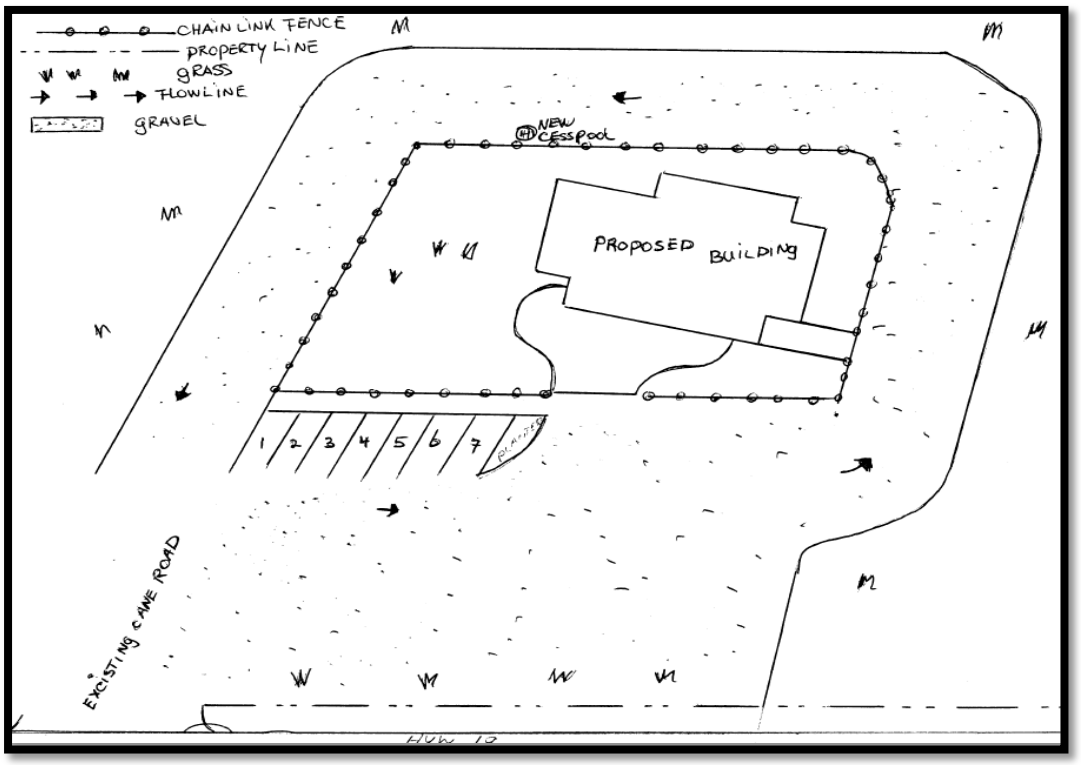
Located at either TMK 3rd/4-1-04:33 or TMK 3rd/4-2-07:02 at approximately 1400' elevation
see site map on page 26

FLOW CHART


Milk Barn Waste Water
weeping wall
irrigation
pump
panel
panel
solids
flush from alleys
2 compartment tank panels can be lifted for agitation for sprinkler field application
Flush Water
flush valve
flush valve

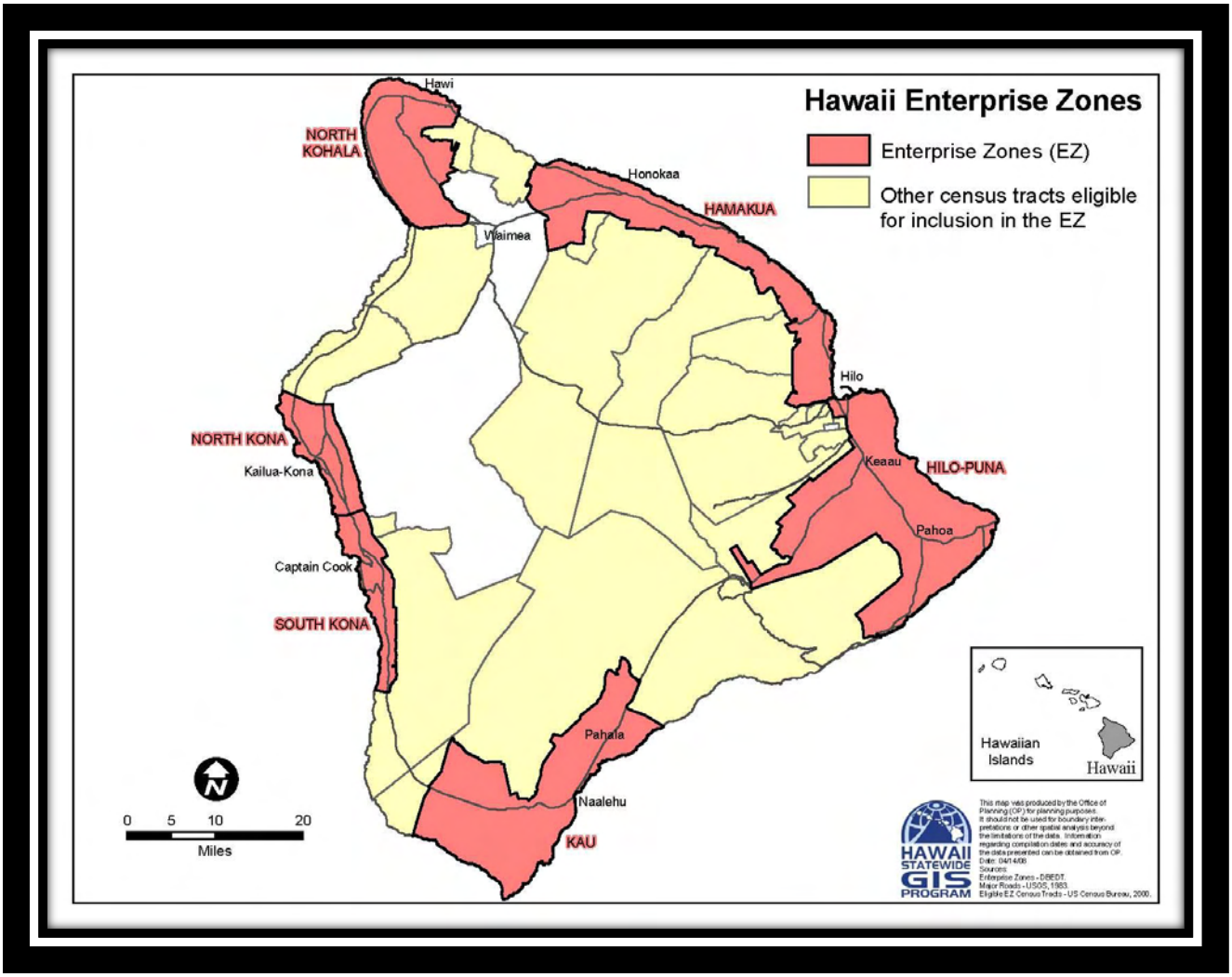
The Future Milk Processing Building

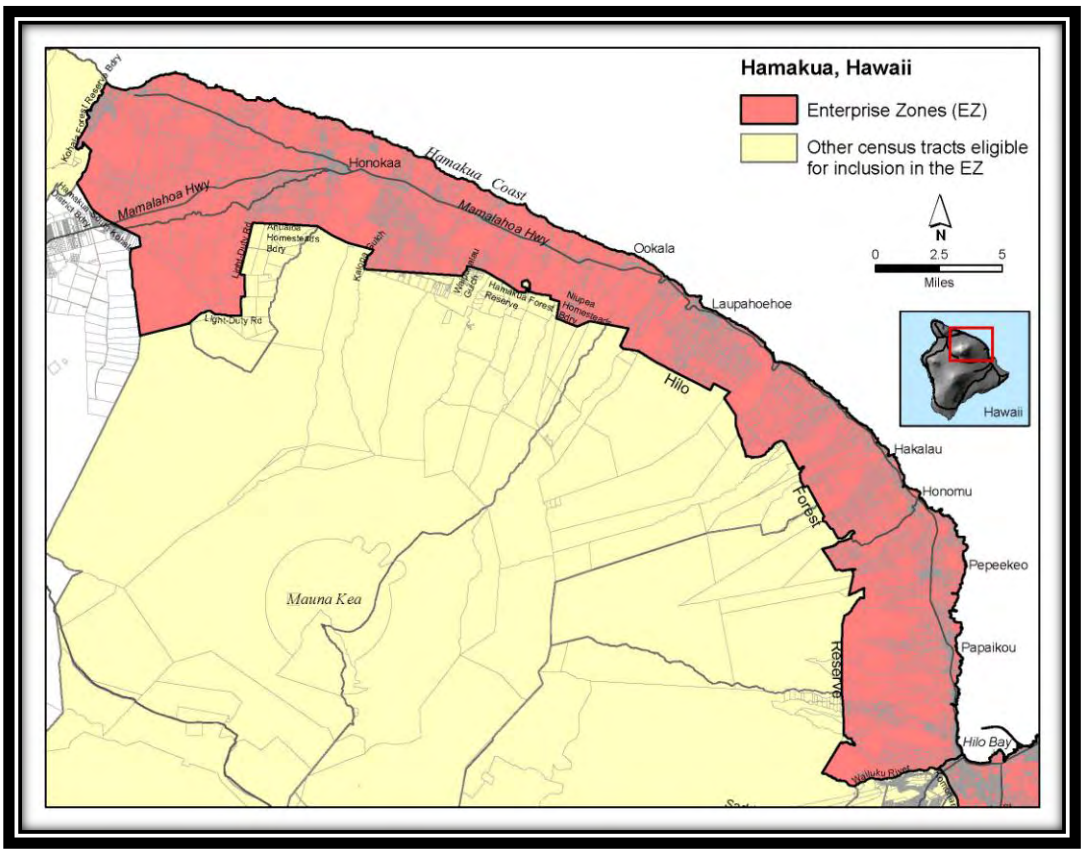
Proposed Layout of Processing Area



Located at TMK 3rd/4-1-04:33
900-920' elevation
see site map page 26

Hawaii Enterprise Zone Partnership Program





The Enterprise Zones (EZ) partnership is a joint state-county effort intended to stimulate—via tax and other incentives—certain types of business activity, job preservation, and job creation in areas where they are most appropriate or most needed. Up to six zones can be designated per county. (See maps for existing zones.)

The proposed lease site is located in the Hawaii Enterprise Zone Partnership Program and the Cheesery has already been accepted by the program and the Dairy is in the application process.